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PROVISIONS FOR ELDERLY AND HANDICAPPED PEDESTRIANS



.2. Hazards, Barriers, blems, and the Law

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Final Report



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FOREWORD

This report describes the investigation of the problems and hazards experienced by elderly and handicapped pedestrians. From these investigations, countermeasures were developed and field tested. Another product of this research is a manual for "Development of Priority Accessible Networks," (Implementation Package, FHWA-IP-80-8). This manual presents design information and methodology for creating a barrier free pedestrian facility.

Research in pedestrian safety is included in the Federally Coordinated Program of Highway Research and Development as Task 1 of Project 1E, "Safety of Pedestrians and Abutting Property Occupants." Mr. John C. Fegan is the Project Manager, Office of Research, and Mr. Richard Richter is the Implementation Manager, Office of Development.

Sufficient copies of this report are being distributed to provide a minimum of two copies to each regional office, one copy to each division office and one copy for each State highway agency. Direct distribution is being made to the division offices.


Charles F. Scheffey
Director, Office of Research
Federal Highway Administration

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16. Abstract Ten categories of handicapped pedestrians are identified. Four of these categories report 71% of vehicular and non-vehicular accidents involving the target group; and 82% of the accidents occurred on walks/corridors, at street crossings, at curbs and curb ramps, and on stairs. A survey was conducted in 5 cities to determine the problems experienced by elderly and handicapped pedestrians. A typology of barriers and problems has been generated. A review of Federal, State and Local legislation treating accessibility is set out. This volume is the second in a series, and the others are: <table border="1"> <thead> <tr> <th>Vol. No.</th> <th>FHWA No.</th> <th>Short Title</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>79-1</td> <td>Executive Summary</td> </tr> <tr> <td>3</td> <td>79-3</td> <td>The Development and Evaluation of Countermeasures</td> </tr> <tr> <td>Implementation Package</td> <td>IP-80-8</td> <td>Development of Priority Accessible Networks</td> </tr> </tbody> </table>						Vol. No.	FHWA No.	Short Title	1	79-1	Executive Summary	3	79-3	The Development and Evaluation of Countermeasures	Implementation Package	IP-80-8	Development of Priority Accessible Networks
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PROJECT TEAM

For the Pedestrian Research Laboratory, Georgia Institute of Technology:

John Templer, Principal Investigator

Research Associates

Part 1

Michael Bronzini, Ph.D.
Bruce McNabb, B.S.C.E.
Paul Wright, Ph.D.

Part 2

Michael Jones, B. Arch.
Elliott Pavlos, M. Arch., M.C.P.
John Templer, Ph.D.

With the assistance of:

John Basmajian, M.D., School of Medicine, Emory University
Fred Crawford, Ph.D., Center for Research in Social Change, Emory University
S. Mitra, Ph.D., Department of Sociology, Emory University

Part 3

Francis A. Curtiss, M.Ed, Emory University Rehabilitation Center

Research Assistants

John Bangs, Erich Burkhart, Frank Eppell, Lee Goodson, Charles Hummel, Cary Kelly,
Pam Markert, Sheila MacIntyre, Janice Nease, Aline Smith, Gary Tradewell, Ruthie
Walters

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introduction

The pedestrian's part of the built environment has evolved without much deliberate attention to their needs. In fact, the pedestrian's needs are probably much less well understood than those of motorized transportation. As a society we have invested heavily in motor transportation both in terms of capital and research, and the body of knowledge aggregates at a substantial rate. There is no comparable rate of expansion in our knowledge about pedestrian needs and responses.

Construction and maintenance regulations for motorized transportation mandate certain minimum standards for each mode—standards for gradients, layout and geometry, for flow and capacity, traffic surface, safety and comfort, and so forth. For the pedestrian, on the other hand, there are no similar mandates. The professional literature is sparse. Funded research has been minimal. To the best of our knowledge, only one university in the United States offers a course for credit that concentrates on pedestrian planning. And cities with plans for pedestrian movement are as unusual as cities that do not have transportation plans. The needs of the pedestrian are usually considered only as an adjunct to the needs of the motor vehicle.

For some of us, the inadequacies of the pedestrian environment are inconvenient and sometimes hazardous. But for those who are handicapped, this same environment is as difficult to use as an unexplored jungle trail might be for the able-bodied; it presents a sequence of pitfalls, and dangers, and every now and then, progress is halted completely by something that bars the way as effectively as a range of mountains.

The idea of a built environment that is free from barriers in the sense that it is accessible to the handicapped as well as the rest of society is now widely accepted, and in fact, federal and state legislation mandates accessibility. The question is, what is an accessible environment, and what are the special needs of the handicapped pedestrian (and what are these handicapping conditions)? These questions have been addressed to some extent in studies directed at making buildings accessible, but similar questions concerning the exterior environment have received little attention. For this reason, the Federal Highway Administration of the U.S. Department of Transportation initiated a research study, "Provisions for Elderly and Handicapped Pedestrians". The Pedestrian Research Laboratory of Georgia Institute of Technology has carried out this contract and the work is described in a series of technical reports. An Executive Summary of the whole project constitutes Volume 1.

The report that follows is Volume 2 of the series. It is divided into three parts. Part 1 is directed at identifying the major hazards experienced by the handicapped; the types of accidents that occur and what causes them, and how each of the handicapped groups is affected. Part 2 looks at the environmental barriers and problems. Field studies surveying the difficulties experienced by handicapped people are described, and a typology of barriers and problems is developed. Part 3 considers the federal and state legislation that covers access to the pedestrian environment.

Volume 3 deals with solutions to some of these problems. It describes laboratory and field tests which were carried out to evaluate some proposed solutions, and some existing ways of overcoming barriers. Finally, the conclusions and recommendations from the study have been incorporated into The Implementation Package, "A Manual for

Developing a Priority Accessible Network". This manual describes a planning process for systematically extending the accessible paths in an urban environment; and then provides recommended design solutions for many of the elements that cause difficulty for the handicapped pedestrian.

introduction

The pedestrian environment is not usually thought of as hostile (except perhaps in high crime areas). Most of us use corridors, sidewalks, pathways, crosswalks, parks and playgrounds with little thought about the potential hazards. We tend to discount the dangers inherent in the physical environment because they are not sufficiently obvious or frequent and perhaps because we accept the risks.

Some of the hazards are well known and regularly receive publicity in the media. It is quite well understood that pedestrians and vehicles cannot share common pavement space without some serious consequences. The magnitude of this problem on the other hand is probably not generally known.

There are other hazards for the pedestrian which occur with much greater frequency and with equally serious consequences. For example, the overwhelming majority of serious pedestrian accidents do not involve motor vehicles. They are falls on the level and falls while changing level--on steps and stairs. The falls on the level are as a result of slips, trips, stumbles, falling into unguarded holes, etc. The falls on stairs can be attributed in part to the inherent dangers presented by stairs, in part because of poorly designed stairs, and in part from carelessness by the stair users.

There has been a substantial level of research activity into the nature and causes of pedestrian/vehicular accidents over the past few years. However, there has been little investigation of other types of pedestrian accidents (the exception to this is stairs which have received substantial attention over the past ten years).

Most of the pedestrian accident studies have treated the whole population; however, recently, children have been identified as a high risk population and vehicular accidents in which they are involved have been investigated and countermeasures developed. But there has been increasing evidence that the elderly and handicapped population are also over represented in pedestrian accidents.

a survey of the literature

Introduction

Pedestrian accidents are a significant problem in contemporary urban society. The National Safety Council estimates that 120,000 pedestrians are struck by vehicles every year. And thousands of pedestrians are injured in nonvehicular accidents, most of which are falls. However, the absolute number of pedestrian accidents does not reveal the full dimensions of the problem. Consideration must also be given to the severity of these accidents.

Collisions between pedestrians and vehicles inherently have serious consequences for the pedestrian. The National Safety Council found that collisions between pedestrians and vehicles result in approximately 10,500 deaths per year. In 1973, pedestrian fatalities accounted for over 19% of all motor vehicle deaths; local statistics confirm

these findings. For example, in²1969 there were 83 fatalities in the jurisdiction of the San Diego Police Department, and pedestrians were the victims in 29 of these fatalities. The pedestrian deaths were 41% of all traffic deaths in that year. These statistics lead us to conclude that the causes of pedestrian accidents need attention.

Studies of pedestrian accident statistics^{3, 4, 5, 6, 7, 8, 9, 10} reveal two important facts: 1) the greatest number of pedestrian accidents occur to children; and 2) the most severe pedestrian accidents involve elderly and handicapped people. To reduce the number of pedestrian accidents, injuries, and deaths to a significant extent, it will be necessary to focus on countermeasures to protect these subgroups particularly. The survey that follows discusses the recent literature on the subject as a first step towards developing countermeasures.

pedestrian accidents of the handicapped and elderly

The first part of this section deals with studies of pedestrian accidents based on aggregate data, and divides the entire handicapped population into three groups: children, the elderly, and the handicapped. The second part examines a case study report about pedestrian accidents of handicapped people.

PEDESTRIAN ACCIDENT STUDIES BASED ON AGGREGATE DATA

Children

Children are involved in a significant number of all pedestrian accidents. An examination of national accident statistics shows that over one-half of the nonfatal pedestrian injuries occur to children less than 16 years of age.⁹ This percentage is far greater than the percentage for any other age group of similar size. The large number of pedestrian accidents in this age group produces a low fatality rate. But while the fatality rate for children involved in pedestrian accidents is not high, the number of fatalities is still significant. In⁴ fact, traffic accidents are the leading cause of death for children 5 to 14 years of age.

Causes

Many researchers have found that the primary cause of child pedestrian accidents is the child running into the street.^{11, 5, 12, 13} Children are usually playing near their home when they suddenly dash into the path of an approaching vehicle. Blackman's conclusion is typical. He states, "the greatest danger to children comes from their undisciplined, uncautious playful behavior near their homes."¹¹

Many factors apparently contribute to the child's unexpected dash into the street. Fruin finds that "children are especially vulnerable (to pedestrian accidents) due to gaps in language, perception, and visual and auditory comprehension..."¹⁴ This indicates that the child's behavior is often based on a lack of understanding rather than a willful

disobedience. Certain family and environmental factors also increase the probability of pedestrian accidents involving children. Comparisons between children involved in pedestrian accidents and children not involved in pedestrian accidents reveal several important findings. The children in the accident group came from homes with less parental supervision and fewer play facilities. These studies also showed that the local neighborhood of the accident victims had fewer playgrounds and less open space.

It is significant to note that the child's trip to and from school is not a major source of pedestrian accidents. Statistics show¹⁵ that less than 10% of the child pedestrian accidents occur during the school trip.

Countermeasures

Several interesting and innovative solutions have been proposed to reduce the number of pedestrian accidents involving children. The primary goal of each of these countermeasures is to keep the child from running into the street. It appears that the enforcement solution has application only in high pedestrian volume situations such as a school crossing. The random nature of collisions between children and vehicles makes strict enforcement of pedestrian laws difficult.

A study by the Los Angeles County Road Department concluded that education was the most effective way to improve pedestrian safety for children.¹¹ One of the most popular educational tools is the "Safety Town" program. It uses classroom instruction and actual traffic experience to accomplish the educational task. The "Safety Town" program has been very effective in reducing pedestrian accidents during school trips.

Additional solutions have been proposed in the engineering area. Marsden¹² advocates the redeployment of street parking as a possible countermeasure. He also suggests that new streets be built at a slightly elevated level. He believes that an increase of six inches in the profile of the street and the use of a six-inch curb will reduce the number of dart-outs by children. A more applicable countermeasure is Blackman's suggestion that more off-street play facilities be provided in urban residential areas. These play facilities should reduce the need for children to play in or near the street.

The Elderly

Elderly pedestrians are also involved in a large number of pedestrian accidents. One obvious reason for this situation is that elderly people do more walking than middle-aged people. Many elderly people do not have access to an automobile. Therefore, unless they can use a public transit system, they must make their trips on foot. As Hurley and Thompson point out, "Older people are a very mobile group; assumptions that they are an infirm group of little mobility are not true."⁴

There are a great number of theories as to why elderly people are involved in pedestrian accidents. Most of these theories are based on the physical or psychological characteristics of the elderly. Many of the characteristics are partial or total handicaps of one form or another. In many instances, the handicap is a result of old age rather than any specific accident or birth defect.

Causes

1. Physical. Several researchers^{17, 4, 18, 19, 20} have found that poor eyesight is the cause of many elderly pedestrian accidents. Typical problems include: recognizing vehicles, reading signs, and distinguishing colors.

Loss of hearing is also a significant problem for elderly people. The failure to hear a horn, a siren or other traffic noises greatly increases the possibility of a pedestrian accident.

Many elderly people also have problems with simple individual movements. They almost never run. The dart-out type of accident is almost nonexistent among the senior citizens. In Tharp's study of pedestrian accidents in Houston there were 12 accidents involving elderly people. Each of the victims was walking at the time of the accident.¹³ Elderly people frequently overestimate their speed of movement. They tend to believe that they have not slowed down since their youth. This overestimation is very critical when the elderly person decides to cross the street in front of the approaching vehicle. Additional dangers for elderly people arise from difficulties in stepping up and down curbs, climbing steep hills, and walking on uneven sidewalks.

2. Psychological. Some elderly people are confused when they traverse the traffic scene. This disorientation may be caused by senility or it may be the side effects of medication. It is frightening to note that "of the 20 medications¹⁹ most frequently taken by elderly people, 12 have a sedating effect on the brain." The confusion experienced by elderly people may also be engendered by the lack of clarity of the pedestrian environment. Signs, traffic signals, turning vehicles, and pedestrian signals may contribute to disorientation.

The degenerative process in the bodies of the elderly tend to slow down the normal mental processes. The elderly person is capable of making a deliberative decision such as where to cross the street. But he is no longer able to make quick decisions, such as when to cross, when to wait, when to stop or when to go. This theory is confirmed by Herm's study of pedestrian behavior in crosswalks in San Diego. His data shows that "people in the 65-69 year old group were involved in 13 accidents²¹ in marked crosswalks but showed no involvement in unmarked crosswalks."

Elderly people tend to be fearful of the pedestrian environment. Some of the most common fears are: fear of becoming lost, fear of becoming confused, fear of being hit by a vehicle, fear of being attacked, and fear of turning vehicles.¹⁷ These fears make the elderly person unsure of his movement. He is frequently worrying about one of these fears and his concentration on the immediate situation is very poor.

Weiner¹⁰ summarizes the causes of elderly pedestrian accidents this way:

In summary, through life-long habits, neglect, contempt for law and particularly for automobiles, lack of understanding of traffic control devices, and poor sensory and motor capability, the elderly pedestrian daily faces unnecessary dangers.

Countermeasures

Several countermeasures for pedestrian accidents of the elderly population emphasize education.^{4, 12, 20} Clearly, the educational program must be sustained. Older people do not learn as quickly as children and they forget the lessons very rapidly without periodic reinforcement.²⁰ Lessons that might be emphasized in an educational presentation for the elderly include:

1. Facts about speed and stopping distance.
2. Compensatory actions for failing eyesight and hearing.
3. General pedestrian safety rules, such as where to walk and what to wear.

Weiner disagrees with the reliance on enforcement or educational programs. He states:

Exhortations to 'crack down' on offenders, or to show movies on safe walking behavior at senior¹⁰ citizen clubs, or other well-meaning methods are probably doomed to failure.

Weiner advocates the use of design countermeasures. Several other researchers concur with this conclusion. Carp¹⁷ believes that "clear and unambiguous pedestrian directions and longer pedestrian signal intervals" would improve the pedestrian environment. Libow¹⁹ offers these possible improvements:

1. Multiple sensory directional orientation systems.
2. Use of striped crosswalks.
3. Low curbs.
4. Increased illumination of traffic lights.
5. Pedestrian rest areas.

Other Handicapped People

The number of reports detailing pedestrian accidents of other types of handicapped people is very limited. Several reasons can be cited for this shortage. Accurate accident statistics are not maintained for this group of people. Even in situations where a handicapped person is identified, he is usually classified in the standard manner by age and sex. Another reason for the small number of reports is the small number of pedestrian accidents of these handicapped people. In many local areas, a handicapped pedestrian is unable to move safely about the streets by himself. This lack of mobility is very discouraging to the handicapped person because it removes the possibility for normal social interaction. However, the small number of accidents is not indicative of the actual number of handicapped people.

The diverse groups of handicapped people tend to have different characteristics and problems. This means that the causes and countermeasures for each group are often dissimilar.

Causes

Many features of the pedestrian environment create difficulty for the handicapped person. Some of these designs can cause pedestrian accidents. Fruin¹⁴ identifies several of these barriers:

...steps or curbs that are too high, long flights of stairs, inaccessible elevators,

steep and narrow walks, gratings in walkways, narrow doorways, revolving doors, narrow aisles, and the lack of a redundant auditory system to aid visually impaired and partially sighted people in the use of visual aids.

Another cause of pedestrian accidents is alcohol. Tharp's study in Houston found that the pedestrian had been drinking prior to the accident in almost 10 percent of the accidents.¹³

Countermeasures

Almost all of the countermeasures proposed to help the handicapped person are based on design modifications. Robert's survey⁹ of visually impaired and deaf people reports the improvements that are advocated by the handicapped people. The visually impaired people recommended:

More and wider sidewalks and crosswalks, more use of pedestrian/vehicular separation, use of textured pavements, use of angular sidewalk corners at intersections, and Braille maps for directional information.

The deaf people recommended:

Better and clearer signing, more appropriate sign locations, audible crossing signals at various frequencies, more and better lighting, and the use of handrails in certain locations.

It should be noted that the needs of the deaf people are less critical than those of the visually impaired. The major reason for this discrepancy is that deaf people are less limited to the pedestrian mode of travel. With special training, they are capable of driving an automobile.

A countermeasure for people with walking handicaps is the modification of stair design. Templer²⁵ recommends a range of riser heights, tread depths, and other layout dimensions which are "safe, comfortable and convenient."

The most appropriate countermeasure for the intemperate drinker is the enforcement of local laws concerning public drunkenness. Marsden¹² recommends that all pedestrian accident victims be tested for the presence of alcohol and other drugs. He believes that this analysis would help to identify the actual problem of the drinking pedestrian.

PEDESTRIAN ACCIDENT STUDIES BASED ON CASE STUDIES OF INDIVIDUAL ACCIDENTS

The only study exclusively devoted to handicapped people is Marsden's examination of fatal accidents involving intoxicated pedestrians in San Diego County, California. This report shows that alcohol is a causal factor in many pedestrian accidents. An examination of accident records showed that the drinking pedestrian contributed to at least 25 percent of the fatal pedestrian collisions in San Diego County.²⁴

Marsden's research focused on the case study of 50 fatalities involving intoxicated pedestrians. Important facts about the accidents were assembled from the coroner's records and police reports. The individual analysis of each accident was used to identify the significant causal factors and to propose appropriate countermeasures.

Causes

The behavior of the drinking pedestrian is a major cause of accidents. Confusion and disorientation are very common characteristics. Marsden's study found that 60 percent of the accidents were of the dartout type.²⁴ The pedestrian suddenly appears in the street away from a marked or unmarked crosswalk. The driver of the vehicle cannot avoid collision and the pedestrian dies as a result of the accident.

Environmental conditions also cause many pedestrian accidents. All of the cases in Marsden's study occurred at night, and many of them occurred where there was little or no lighting.²⁴ Most of the accident locations were outside the major business and shopping areas and they did not occur near the local drinking establishments.

Countermeasures

The countermeasures for the reduction of accidents involving intoxicated pedestrians must necessarily be removed from the time and place of the accident. These accidents seem to occur at unpredictable hours and in unexpected locations. Of the 50 cases examined in Marsden's study, only two cases were located within one-half mile of each other.²⁴ This dispersion causes isolated enforcement programs and individual design improvements to be relatively ineffective.

Marsden's recommendations involve education prior to an accident and prosecution after an accident. His three proposals are:

1. A modification of driver education programs to increase emphasis on pedestrian hazards.
2. An intensive and realistic program for employing detoxification and rehabilitation centers for the treatment of acute alcoholism and problem drinking.
3. A revision of state and local laws should place criminal responsibility upon the intoxicated pedestrian who is found to be the cause of a collision.²⁴

conclusion

Several significant conclusions regarding the causes and countermeasures of pedestrian accidents of elderly and handicapped people can be made at this time. These conclusions are based on the preceding survey of all current and available literature in the field.

Causes

The major causes of pedestrian accidents have been established by previous research. Certain factors may be identified with particular groups of people, such as the elderly or the handicapped. While national statistics produce an excellent impression of the scope of the pedestrian accident problem, the case study approach is much more successful in identifying specific causal factors. One promising method of implementing the case study approach is the interview of pedestrian accident victims. The Interdisciplinary Workshop on Transportation and Aging recommended this procedure in 1970: "It would be desirable to interview the aged pedestrian involved in accidents and correlate design defects to accidents."³

Countermeasures

The significant countermeasures proposed in the literature can be grouped into five categories: enforcement, safety campaigns, education, city planning, and physical design.

Several enforcement programs have achieved good short-term success in reducing pedestrian accidents. However, in the long run, the enforcement countermeasures require large amounts of manpower and money. Most communities are unable or unwilling to make this type of investment. While enforcement programs will continue to be an appropriate countermeasure for occasional implementation, they are not a permanent solution.

Safety campaigns are also effective in the short run. However, their effectiveness frequently lasts no longer than the safety campaign. The long-term effects of a safety campaign are practically negligible. Safety campaigns are most effective when they are used on an annual basis, such as at the start of the school year.

Educational countermeasures are used to instruct children in safe street crossings. Until the educational process can be effectively extended for all types of handicapped people, its value will be limited.

Countermeasures which are based on city planning solutions are theoretically very effective in reducing pedestrian accidents. Proper management of land use and transportation facilities can produce a much safer pedestrian environment. The major weakness of these programs is the long time delay from theoretical conception to implementation of the plan. These long delays may discourage many municipal governments.

The final type of countermeasure for the reduction of pedestrian accidents is the physical design approach. This solution is based on a principle of human factors engineering:

One should design a system in such a way that errors are avoided because the design makes them impossible—rather than rely on conscious cooperation,

prudence, and caution of the operator. So it is with the pedestrian, particularly the very young and very old.¹⁰

While the concept of the physical design countermeasures has existed for quite a while, implementation has been very slow. Now is the time for the practical implementation and evaluation of these theoretical proposals. Marsden¹² concurs with this opinion:

It is, therefore, the recommendation of this investigator that subsequent research on pedestrian collisions confine their examination to the recommendations of the various studies and evaluate the effectiveness of those recommendations.

If we wish to reduce the pedestrian accidents of elderly and handicapped people (as well as the pedestrian accidents of the general population), we must use design countermeasures to reduce the causes of these accidents and to create a safer pedestrian environment. This improved environment must be designed for all of the people and requirements of the elderly and handicapped people given particularly close scrutiny.

studies of accidents involving elderly and handicapped pedestrians

Introduction

From the discussion thus far, it seems that there have been very few studies of the nature and causes of vehicular/pedestrian accidents involving the elderly and handicapped and no published studies of non-vehicular accidents involving this group. While information on two of the subgroups of this segment of the total population, children and the elderly, has been the subject of some research, very little previous work has addressed the other handicapped groups.

To gain a better understanding of the particular hazards facing the target groups, two studies were undertaken. For the first study, an accident reporting section was included in an unstructured survey carried out in five cities (and described in Part 2 of this volume, "Environmental Barriers and Problems"). This accident reporting section includes vehicular and non-vehicular incidents and the results of this study are described in this section.

Concurrent with the Five-City Survey, a study of accidents involving elderly and handicapped pedestrians was carried out in Atlanta.

accidents in Atlanta

The objectives of the Atlanta accident study was to enlarge our understanding of the nature and causes of pedestrian accidents in which elderly and handicapped people are involved, and then to suggest some appropriate countermeasures. Specifically, the aim was to identify what types of accidents the target group experienced, and to what

extent these accident types differ from or are similar to those experienced by the rest of the population. This entailed developing a method for identifying accidents in which pedestrians were involved; eliminating those cases which did not involve elderly and handicapped people; investigating the remaining cases to try to establish what type of accident occurred and what were the causes; comparing the results with those from previous accident studies of the general population; and, finally, developing some testable hypotheses for countermeasures that may reduce the accident rate.

The scope of the study was limited in time, eight months from start to finish. And for similar reasons, it was limited to the Atlanta metropolitan area. These two limitations and the inevitable cost constraints limited the data that could be examined in practice, and therefore the usefulness of the results. Nevertheless, the results, and those of the Five-City Accident Survey described in the next section, provide strong indications of the particular hazards that are typically experienced by elderly and handicapped pedestrians.

Procedures

The Atlanta accident study was carried out in four phases:

- Phase 1. Identification of pedestrian accidents involving the elderly and handicapped.
- Phase 2. Interviews conducted to try to establish the facts relating to the accidents.
- Phase 3. Conducting field evaluations of the accident sites.
- Phase 4. Evaluating the data and drawing conclusions.

The remainder of this chapter follows this sequence.

Phase 1: Identification of Pedestrian Accidents Involving Elderly and Handicapped Pedestrians.

Several sources of information on pedestrian accidents were investigated--police records, ambulance records, insurance records, and hospital emergency room records. Two of these sources were quickly rejected. Insurance companies were reluctant to participate. And the ambulance system in the Atlanta metropolitan area did not keep records that were useful for the study. The police records, as discussed later, were adequate, but seldom included reports on nonvehicular accidents. The hospital emergency room data required special procedures in order to collect the data, but the data were quite substantial and included all kinds of pedestrian accidents. However, the data was not kept in a central file like the police records; the data was available in each of the many metropolitan Atlanta hospital emergency rooms. For these reasons it was decided to make use of the police records and to gather data from two Atlanta hospitals that agreed to participate--Grady Memorial Hospital and Piedmont Hospital.

Atlanta Police Department

The initial source for pedestrian accident reports was the 1973 file of vehicular traffic accidents in the Traffic Division of the Atlanta Police Department. This file was used because it was the largest available source of serious pedestrian accidents in the city. The 1973 vehicular accident file contained reports of approximately 20,000 traffic accidents in the City of Atlanta.

Selection. An inspection of the vehicular accident file was made in August, 1974. Each of the police reports was inspected for any type of pedestrian involvement. A thorough survey of the file revealed that pedestrians were involved in only 538 of the 20,000 accidents. The elimination of 17 reports of pedestrian accident victims living outside the metropolitan Atlanta area reduced the number of applicable accident reports to 521. The decision to disregard the accidents of the out-of-town people was based on the anticipated difficulty in conducting telephone interviews and the victim's probable unfamiliarity with the accident site.

Information Collected. The collection of information about the pedestrian accidents presented some difficulty. Due to police department regulations it was not possible to remove the accident reports from the police station for photocopying. Nor was it possible to photocopy the accident reports at the police station. Therefore, the information from the police files had to be manually copied. The following information was copied from each of the 521 police reports: the location of the accident, and the victim's name, age, address, and sex.

Location of Victims. Using the information from the police files, the researchers attempted to locate each of the 521 pedestrian accident victims for a telephone interview. Unfortunately, the police reports did not contain the individual's telephone number. Therefore, additional information sources had to be used. The telephone numbers for many of the accident victims were located in the 1973 Atlanta City Directory and the 1974 Atlanta Suburban Directory. Additional information was obtained from the 1973 and 1974 Telephone Directories for Greater Atlanta.

Possible telephone numbers were found for only 296 of the 521 pedestrian accident victims. These 296 usable reports were classified into three groups according to the age of the accident victim. Victims less than 18 years old were classified as children. Victims over the age of 65 were classified as elderly. The remaining accident victims were classified as middle-aged. These classifications were directly related to the definition and identification of handicapped people as discussed earlier. A list of the 296 pedestrian accident victims, their telephone numbers, and all other appropriate information was forwarded to the people hired as interviewers for Phase 2.

Grady Hospital

The second source of pedestrian accident reports was the file of hospital records from the Surgical Emergency Clinic of Grady Memorial Hospital. This hospital receives many of its cases from the central city area of Atlanta. It was expected that this current accident information would produce a high percentage of completed interviews. An

improvement of this type could increase the efficiency of the entire data collection process.

The pedestrian accident information was obtained through the Administration Office of Ambulatory Care at Grady from December, 1974 through April, 1975. Approximately 32,000 hospital records were filed in the Surgery Emergency Clinic during this period.

Selection. The selection of pedestrian accidents from the hospital records was made on a regular basis during the study period. While the researchers provided substantial guidance concerning the definition of a pedestrian accident, the final selection was made by hospital personnel. This selection process disregarded pedestrian accident victims living outside metropolitan Atlanta. Pedestrian accident reports which listed no name or no phone number were also disregarded. A total of 153 pedestrian accident reports were selected from the 32,000 hospital records.

Information Collected. The public information copy of the hospital record provided all of the facts for the pedestrian accident report. This information included: how the accident occurred, the type of injury, and the victim's name, address, age, sex and telephone number.

The reports of the 153 pedestrian accidents were classified according to the age of the victim. Three groups were formulated. These groups were identical to those used for the accident reports from the Atlanta Police Department file.

All of the available information about each pedestrian accident victim was placed on the first page of an individual interview form. An example of this form is shown in Appendix A. The 153 pedestrian accident interview forms were distributed to the interviewers at the earliest opportunity.

Piedmont Hospital

In order to broaden the scope of the project beyond the pedestrian-vehicle collisions found in the Atlanta Police Department file, another hospital was selected as the third source of pedestrian accident reports. Piedmont Hospital in the near northside area of Atlanta was selected for this purpose. In contrast to Grady Memorial Hospital, Piedmont Hospital primarily serves the residents of the near northside area.

The source of pedestrian accident reports at Piedmont Hospital was the file of hospital admission records in the emergency room from December, 1974-April, 1975. There were approximately 10,000 admissions filed during this 18-week period.

Selection. Possible pedestrian accidents were selected from the hospital files by the clerical personnel in the emergency room. The researchers provided substantial guidance to these hospital personnel concerning the definition of a pedestrian accident. However, the emergency room personnel made the final selection.

Pedestrian accidents were a small part of all emergency room admissions at Piedmont. The possible pedestrian accident population was further reduced by the elimination of

all possible pedestrian accident victims residing outside metropolitan Atlanta. All pedestrian accident reports which failed to list the victim's name or telephone number were also disregarded. All of these constraints reduced the number of possible pedestrian accident reports to 540.

Information Collected. The following information was furnished to the researchers by the hospital personnel: how the accident occurred, the type of injury, and the victim's name, address, age, sex and telephone number. It should be noted that the researchers never saw the actual hospital admission record.

Each of the 540 possible pedestrian accident reports was categorized according to the age of the victim. The classifications were identical to those used for the Atlanta Police Department accidents. All of the available information about each of the 540 possible pedestrian accident victims was placed on the first page of the standard interview form. These forms were forwarded to the interviewers at the first opportunity.

Additional Sources

Consideration was given to one additional source of pedestrian accident information. In October, 1974, the researchers inspected the 1973 General File of the Records Division of the Atlanta Police Department. This file contained approximately 20,000 reports which could not be assigned to an appropriate section of the Atlanta Police Department (traffic, vice, homicide, etc.). Administrative personnel, familiar with the General File, estimated that the File would contain 15 pedestrian accidents. The researchers judged the inspection of the General File to be unworthy of further consideration.

Phase 2: Interviews Conducted to Try to Establish the Facts Relating to the Accidents

A total of 989 possible pedestrian accident reports were submitted to the interviewers. Each report was transmitted to the interviewers as soon as it was processed. This was done in order to minimize the delay from the time of the accident to the completion of the interview and therefore to produce an accurate account of the accident. All of the interviews were made by telephone between December, 1974 and August, 1975. Telephone interviews were judged to be the fastest way to contact the greatest number of people.

Purpose

There were three reasons for interviewing the possible pedestrian accident victims:

1. To identify the nature of the handicap of the pedestrian accident victims.
2. To acquire all of the pertinent information about the accident.
3. To obtain the victim's opinion of the cause of the accident.

Some of this information was available on selected police reports but none of these facts were found on the hospital records.

The Interviews

While most of the interviewers retained for this project were experienced in this type of work, specific instructions and training were necessary. The interviewers were instructed to eliminate the nonhandicapped and nonpedestrian accident victims from further consideration.

An example of the interview form is shown in Appendix A. This form was developed by the researchers specifically for the telephone survey. Each of the questions is directly related to one of the aforementioned interview purposes. However, the questionnaire was intended to provide an informal guide for the interviewer. It was not intended to be a structured fixed question format. The interviewers were encouraged to conduct each interview in the most convenient and efficient way.

Complete interviews were received for 105 of the 989 possible pedestrian accident victims.

Phase 3: Conducting Field Evaluations of the Accident Sites

Engineering field studies were made for some of the accident sites identified in the interviews of handicapped pedestrian accident victims. The purpose of these field studies was to identify and describe the specific cause of each pedestrian accident. Emphasis was placed on the measurement of the physical features in the pedestrian environment at each accident site.

Selection

It was not possible to investigate each of the 105 accident sites in the time allotted for this portion of the study. Therefore a selection system was established to use the available field study period in the most efficient and productive way. This system involved the elimination of several categories of pedestrian accidents from consideration for field studies.

These categories were:

1. Accidents which occurred at imprecise locations.
2. Accidents which occurred inside buildings.
3. Accidents which occurred on private residential property.

The elimination of these categories reduced the number of handicapped pedestrian accident reports available for field study to 53.

Preparation

The interview with each pedestrian accident victim was carefully reviewed prior to the inspection of the accident location. In the case of the pedestrian accidents reports derived from the Traffic Division of the Atlanta Police Department, additional

information about each field study was collected from the original police report. A convenient checkoff form, shown in Appendix A, was used for this task. Police reports were not available for all of the pedestrian accident reports from the hospital sources. Consequently, the police reports were not considered for any of the hospital cases.

On the basis of the completed interview forms and the available police reports, a field study report form was developed. An example of this two-page form is shown in Appendix A.

All field study sites were plotted on a large map of Atlanta. Accident locations in the central business district were plotted on a separate map. These procedures enabled the researchers to group adjacent accident sites for individual field trips. The location of each group of accident sites was transferred to a portable map for the daily field studies. This process increased the efficiency of the field studies.

Implementation

The actual investigations of the accident sites were made in July and August, 1975. A total of 45 accident locations were examined. Standard surveying equipment was used for the field measurements. A Rolatape model 180T was used for longer distances. Photographs were taken with a Grafic 35 mm camera and a Kodak 126 Instamatic camera.

Review

Each completed field report was checked for accuracy and clarity. Questionable descriptions or comments were reviewed with the field investigation team and the accident sites were reinspected, if necessary. The condition diagram and the collision diagram from the field report were redrawn at an appropriate scale by the surveyors.

Phase 4: Evaluating the Data and Drawing Conclusions

An evaluation was made of all accident reports which contained interviews with handicapped victims. The evaluation included field study cases and nonfield study cases. The researchers completed each evaluation with the full knowledge of all available information. Photographic slides, field reports, interview reports and police reports were considered in the evaluation process.

On the basis of this evaluation the researchers identified and recorded the specific causes and suggested countermeasures of each accident. Next, the specific causes were summarized and categorized into general causes. General countermeasures, based on the specific countermeasures and the general causes, were also identified and noted. The complete discussion of these results follows.

Results and Discussion of Results

The results are separated into two major sections: (A) preliminary results and (B) final

results. To facilitate comprehension, the objective results and the subjective analysis of the results for each part of the project are presented concurrently.

A. Preliminary Results:

The preliminary results are the findings from Phases 1 and 2. First, from Phase 1, the three sources of pedestrian accident reports are presented. This is followed by a review of the interview results from Phase 2.

A numerical summary of the pedestrian accident reports gathered for the project is shown in Table 1. The reports are classified by the source of the information and by the victim's handicap. The period of information collection for each source is also displayed.

Table 1: Sources of Pedestrian Accident Reports

Source of Report	Number of Pedestrian Accident Victims			
	Handicapped		Unknown Condition	Total
	Children	Elderly		
Atlanta Police Department (1/73-12/73)	85	31	180	296
Grady Memorial Hospital (12/74-4/75)	69	3	81	153
Piedmont Hospital (12/74-4/75)	125	116	299	540
Total	279	150	560	989

Number of Reports. An inspection of Table 1 reveals several interesting facts about the total number of accident reports from the three sources:

1. Almost 55% of the total number of accident reports were collected from Piedmont Hospital in an 18-week period.
2. Only 15% of the total number of accident reports were collected from Grady Memorial Hospital during the same 18-week period.
3. Only 30% of the total number of accident reports were collected from the Atlanta Police Department during an entire year.

There are at least two reasons for this apparent incongruity. The first reason concerns the type of information provided by each source. For example, the large number of accident reports from Piedmont Hospital is attributed to the incomplete information on the hospital record. In many cases, the hospital record from the emergency room provided only the general category of the accident, such as "fall." No details were given about how and where the accident occurred. The absence of this information complicated the selection of possible pedestrian accident reports. In order to obtain all of the valid pedestrian accident reports, a large number of questionable accident reports were included in the sample.

By contrast, the hospital records at Grady Memorial were more descriptive about the cause of the accident. The Grady records frequently contained the exact cause of the accident, such as "hit by a car." This additional information enabled the Grady Hospital personnel to more accurately identify possible pedestrian accidents.

All of the cases selected from the Atlanta Police Department file involved collisions between vehicles and pedestrians. Therefore all of the reports selected from this source were known to be pedestrian accidents and no judgment or evaluation was required.

The second reason for the dissimilar distribution of reports among the three sources is the type of accident reported at each source. While the hospital records contain all types of pedestrian accidents, the only type of pedestrian accident reported in the police file is the collision between a pedestrian and a vehicle. Therefore, the police file contained fewer cases because it received only one type of pedestrian accident.

Classification of Accident Victims. The numbers in Table 1 show an unequal distribution of handicapped types among the three sources. While a little more than half the victims from each source are neither children nor elderly, the relative distribution between these two identifiable handicap groups varies significantly. For example, 45% of the accident victims at Grady Hospital were children and only 2% of the accident victims were elderly, while at Piedmont Hospital 21% of the accident victims were elderly and only 23% of the accident victims were children. The statistics for the Atlanta Police Department reflect a situation between the two extremes, with 29% of the accident victims being children, and the elderly representing 10% of the total number of accident victims.

This unequal distribution of different types of handicapped accident victims can probably be explained by a consideration of the areas serviced by each source. The central city area, served by Grady Hospital, has a high concentration of families. Hence there are many children and many accidents involving children. The central city area also has fewer offstreet play areas and more multi-family dwelling units. These factors also contribute to the large number of pedestrian accidents involving children. The area of service for Piedmont Hospital is the near north side of Atlanta. This area has a relatively low concentration of families. There are many single people living in this area and a large number of senior citizens' housing projects are also located there. Therefore, Piedmont Hospital received more elderly people and fewer children. The Atlanta Police Department serves the central city area and the near north side area as

well as the rest of the City of Atlanta. Therefore, the accident statistics from that source show a distribution between the two extremes.

Interviews. The interviewers attempted to conduct telephone interviews with 989 possible pedestrian accident victims. The numerical results of the success rate of these interviews are provided in Table 2.

Classification. As can be seen from Table 2, the results of the completed interviews were classified into seven categories. An eighth category was reserved for uncompleted interviews. A preliminary separation was made between the victims who were interviewed and those who were not interviewed. There were two classifications of victims who were not interviewed: (1) victims who could not be contacted, (2) victims who could be contacted but chose not to cooperate. Many of the uncooperative victims cited pending legal situations in their refusal. Another group of uncooperative victims maintained that they were never involved in an accident. Several situations contributed to the large number of victims who could not be contacted by telephone: the telephone had been disconnected, the telephone number had been changed to an unlisted number, or the person had moved.

Five classifications were used for interviewed victims. The first classification was for victims of nonpedestrian accidents. A large portion of the nonpedestrian accidents were household falls. Nonhandicapped pedestrian accident victims were classified into the second group. The handicapped pedestrian accident victims who had been interviewed were classified into three categories: elderly, children, and other handicapped people. The elderly and children classifications were given precedence over the third category in cases involving multihandicapped victims.

Analysis. An analysis of the numbers in Table 2 shows several interesting facts about each of the information sources. The statistics for the Atlanta Police Department reports reveal a large number of uncompleted accident reports. This fact may be attributed to an oversight in the distribution or collection of these reports. The numbers in Table 2 also show a very small number of nonpedestrian accident reports at the Atlanta Police Department. This could be expected due to the nature of the source. The distribution of handicapped pedestrian accident victims is very similar to the corresponding distribution in Table 1.

The distribution of handicapped pedestrian accident victims from Grady Memorial Hospital is also very similar to the corresponding distribution in Table 1: predominantly children, with very few elderly people. There were also several other handicapped pedestrian accident victims from Grady. Many of the nonpedestrian accidents from Grady involved children on bicycles.

Piedmont Hospital accident statistics show a large number of nonpedestrian accidents. Many of these accidents were household accidents or recreational accidents. The large number of people treated at Piedmont who declined to cooperate might be attributed to higher personal income and a desire for privacy. The distribution of handicapped people is almost evenly divided between the elderly and the children, just as in the corresponding distribution in Table 1. Piedmont Hospital also treated several other handicapped pedestrian accident victims.

Table 2: Results of Interviews with Accident Victims

Source	Victims Not Interviewed		Interviewed Victims					Incom- plete*	Total
	Could Not Be Contacted	Uncooperative	Nonpedestrian Accidents	Nonhandicapped Victims	Handicapped victims				
					Elderly	Children	Other		
Atlanta Police Department	71	15	2	41	8	24	2	133	296
Grady Memorial Hospital	46	9	23	16	0	20	3	36	153
Piedmont Hospital	139	50	224	55	20	18	10	24	540
Total	256	74	249	112	28	62	15	193	989

*Interviews that yielded too little data to be useful

Subgroups. The distribution of the 105 pedestrian accident victims that were interviewed is shown in Table 3. The distribution is heavily weighted toward the elderly and the school age children. Preschool children are also a significant accident group.

Table 3. Distribution of Handicapped Pedestrian Accident Victims That Were Interviewed

Subgroup	Number of Victims
1. Walking with special aids	2
2. Walking with difficulty without the use of special aids	4
3. Confined to wheelchair	0
4. Chronic impairment of upper extremities and shoulders	1
5. Pre-school children (under age 6)	11
6. School age children (ages 6-17)	51
7. Elderly people (over age 65)	28
8. Severe auditory impairment	1
9. Severe visual impairment	2
10. Obvious confusion and/or disorientation	5

B. Final Results

The final results are those associated with the evaluation of the causes and countermeasures of the 53 pedestrian accidents that were considered in Phase 3. The specific causes and countermeasures associated with each accident are contained in the Pedestrian Accident Summaries in Appendix B. This section considers the more general categories of causes and countermeasures identified in those 53 accidents.

Identification and Incidence

The evaluation of the specific causes and countermeasures of each Pedestrian Accident Summary (see Appendix B for summaries) has led to the identification of the general causes and countermeasures of pedestrian accidents of elderly and handicapped people, as shown in Table 4.

Table 4: Pedestrian Accidents: Causes and Countermeasures

<u>General Causes</u>	<u>General Countermeasures</u>
<ol style="list-style-type: none"> 1. The failure to accommodate handicapped people in the design and operation of pedestrian facilities. 2. The failure to consider pedestrians in the design of vehicular traffic facilities. 3. The lack of an adequate separation or delineation between pedestrian areas and non-pedestrian areas. 4. The failure to insure that each street is used for its intended purpose. 5. The failure of the pedestrian to consider conflicting vehicular traffic prior to crossing the street. 6. The failure of the pedestrian to consider conflicting vehicular traffic while crossing the street. 7. The failure of the pedestrian to use the available street crossing facilities. 	<ol style="list-style-type: none"> 1. Design and operate pedestrian facilities to accommodate the handicapped. 2a. Design vehicular traffic facilities for the safety of vehicular traffic and pedestrian traffic. 2b. Provide a safe school trip for young pedestrians. 3. Provide an appropriate delineation or separation between pedestrian areas and non-pedestrian areas. 4. Use traffic engineering countermeasures to insure that each street is used for its intended purpose. 5. Provide information (particularly to children and the elderly) about safe and proper pedestrian behavior. 6. Same as Countermeasure No. 5. 7. Same as Countermeasure No. 5.

Table 4: Pedestrian Accidents: Causes and Countermeasures (continued)

<u>General Causes</u>	<u>General Countermeasures</u>
<p>8. The failure of the elderly to realize and adapt to their decreased mobility.</p> <p>9. The driver's disobedience of vehicular traffic regulations.</p> <p>10. The failure of the parents or guardians to properly supervise and educate their children.</p> <p>11. The failure to keep the pedestrian environment clean and free of debris.</p> <p>12. The presence of factors which decrease visibility between the driver and the pedestrian.</p>	<p>8. Same as Countermeasure No. 5.</p> <p>9. Prosecute dangerous drivers for the violation of traffic regulations.</p> <p>10a. Encourage parents to take more responsibility for the supervision and education of their children.</p> <p>10b. Provide information to school children and safety personnel about safe and proper pedestrian behavior.</p> <p>11. Keep the pedestrian environment clean and free from debris.</p> <p>12. Remove objects which obstruct visibility between drivers and pedestrians.</p>

Description

While the identification and incidence of the various causes and countermeasures is valuable, a more detailed description of each general cause and countermeasure is also required. Each description is based on the examples of specific accident reports from the research.

General Causes

The general causes and countermeasures are arranged under several headings which specify the broad area of classification.

Design

1. The failure to accommodate handicapped people in the design and operation of pedestrian facilities.

The causes of pedestrian accidents included in this category reflect the misjudgments made by the designer. The designer simply fails to consider that handicapped people will use that facility. Examples include: a lip on a sidewalk curb (1 case), inadequate lighting on interior steps (1 case), the absence of handrails on irregular outdoor stairs (1 case), and rough spots in the sidewalk pavement (1 case). These inadequate facilities are the cause of many falling type accidents.

2. The failure to consider pedestrians in the design of vehicular traffic facilities.

Many vehicular traffic facilities are designed exclusively for the vehicle; pedestrians are not considered. This type of design is very appropriate for limited access highways such as the Interstate System. However, the same type of design is totally inappropriate for most city streets and other traffic facilities. This lack of consideration for the pedestrian causes many collisions between pedestrians and vehicles.

Some accidents are caused by a lack of any consideration for the pedestrian. Examples include: vehicular parking lots with poor pedestrian access (1 case), busy streets without sidewalks (2 cases), and bus stops at busy intersections without crosswalks (1 case).

Additional pedestrian accidents are caused by a lack of proper consideration for the pedestrian. While some provisions are made for the pedestrian, these provisions frequently do not satisfy the need. For instance: the provision of crosswalks on busy streets without traffic control devices (5 cases), the provision of pedestrian traffic signals without adequate crossing time (1 case), and the provision of a crosswalk at a busy intersection without a stop line on the vehicular approach (2 cases).

There is also a failure to consider pedestrians in the maintenance of traffic facilities. Disappearing crosswalk stripes (1 case), and nonfunctioning pedestrian actuation buttons (1 case) are examples of this neglect.

Finally, the designer must provide more than an initial consideration to the pedestrian at vehicular traffic facilities. In some cases, the designer will have to reevaluate the original provisions and make necessary modifications.

3. The lack of an adequate separation or delineation between pedestrian areas and nonpedestrian areas.

The unchecked accessibility from pedestrian areas to nonpedestrian areas is another major cause of pedestrian accidents. This freedom to wander into areas which are neither designed nor intended for the pedestrian is very dangerous. People who are unaware of this danger, such as children and the elderly, are frequently involved in this type of accident. Many accidents involve a collision between the pedestrian and a vehicle. This causal factor was identified in the following situations: the lack of any delineation between a busy street and an adjacent parking lot (1 case), the lack of any separation between the sidewalk and the street below the crest of a vertical curve (1 case), the absence of any separation between a sidewalk and a busy street with no curb parking (1 case), and the lack of any separation between pedestrian areas and a railroad right of way.

4. The failure to insure that each street is used for its intended purpose.

Pedestrians expect that all streets will be used for their intended function. People expect that: expressways will be used for high speed through traffic, arterials will be used for medium speed through traffic and local streets will be used for low speed local traffic. The pedestrian adapts his behavior to these expectations. When these expectations are violated, the pedestrian is in a dangerous situation which can cause pedestrian accidents.

Children appear to be involved in most of these accidents. Their lack of experience in traffic leads them to believe that the street in front of their house is a safe local residential street. This causal mechanism was observed in two of the accidents in this study (2 cases).

Pedestrian Behavior

5. The failure of the pedestrian to consider conflicting traffic prior to crossing the street.

This type of accident is clearly the fault of the pedestrian. Because of carelessness or immaturity the pedestrian enters the street with no regard for vehicular traffic. Accidents occur when the driver of the vehicle is unable to avoid the collision.

Many of these accidents involve children running into the street (5 cases).

Another involved a child running into the path of a vehicle in a parking lot. Additional accidents of this type include: a child running from behind a visual obstruction, such as a slow moving bus or a telephone pole. In one example, the pedestrian saw the vehicle but he misjudged the vehicle's distance and/or speed.

6. The failure of the pedestrian to consider conflicting vehicular traffic while crossing the street.

This cause is very similar to the previous one. In this case, the pedestrian makes a careful consideration of conflicting traffic before he starts to cross, but he fails to look for traffic while he is crossing. These accidents usually occur on busy streets with moderately high speed traffic. Slow moving elderly people are involved in many of these accidents.

Some of these accidents occur away from a crosswalk (2 cases); others occur inside a crosswalk (3 cases). Pedestrians crossing in a crosswalk mistakenly assume that the driver will stop and yield the right of way. This unproven trust in the driver's obedience to traffic regulations is the cause of many accidents.

Other pedestrian behavior patterns in this category include: the failure to consider the second or third lane of traffic on a multilane street and the inability of the pedestrian to move out of the street when a vehicle is sighted.

7. The failure of the pedestrian to use the available street crossing facilities.

This cause of pedestrian accidents involves elderly people and children. Following a path of least resistance, the pedestrian decided to cross the street away from a crosswalk. The driver of the vehicle does not expect this action and a collision occurs (8 cases). The decision to cross the street away from a crosswalk may be influenced by the ineffectiveness of some crosswalks (see General Cause No. 1, Table 4).

8. The failure of the elderly to realize and adapt to their decreased mobility.

This deficiency on the part of elderly people is a significant cause of many minor pedestrian accidents and a few major pedestrian accidents. Several specific examples of this general causal factor were identified in the research. The first example concerns the failure of the elderly pedestrian to realize that he walks more slowly and that it takes him longer to move across a street (2 cases). Another example is the failure of the elderly to avoid hazardous locations, such as: busy streets (1 case), slippery pavements (1 case), irregular pavements (2 cases), and drainage gratings (1 case). The elderly pedestrian also fails to exercise normal caution and walks down steps backwards (1 case).

Driver Behavior

9. The driver disobeying vehicular traffic regulations.

Not all pedestrian accidents are caused by inadequate design or by pedestrian

behavior. The behavior of the driver is also a significant causal factor in many accidents. The most dangerous and flagrant type of driver behavior is disobeying vehicular traffic regulations. These violations include: failure to yield right of way to a pedestrian in a crosswalk (2 cases), stopping a vehicle in a crosswalk (1 case), speeding (2 cases), and failure to obey a "STOP" sign (1 case).

Supervision and Education

10. The failure of parents or guardians to properly supervise and educate their children.

This causal mechanism is the most prevalent and probably the most serious cause of children's pedestrian accidents. Many accidents of pre-school children are a direct result of the parents' lack of concern (2 cases). However, supervision is not restricted to young children. It extends to older children in special cases, such as reminding the child to wear eyeglasses (1 case).

Pedestrian accidents of older children are frequently caused by the child's ignorance of safe pedestrian practices. Many children do not know how to cross a busy street (7 cases), or why to cross in front of a school bus (1 case) or how to cross from behind a visual obstruction (1 case). Although the schools may provide some assistance the primary responsibility for this education rests with the parents.

Maintenance

11. The failure to keep the pedestrian environment clean and free from debris.

A cluttered and dirty pedestrian environment is very hazardous to elderly and handicapped pedestrians. Slippery conditions, such as water on a greasy and oily pavement (1 case) are very hazardous to elderly people. The presence of grass and weeds on irregular stone steps (1 case) is very dangerous for everyone.

12. The presence of factors which decrease visibility between the driver and the pedestrian.

Trees, bushes and even street furniture such as telephone booths and lighting poles screen pedestrians who are preparing to cross the road at a crosswalk from driver's view.

General Countermeasures

Design

1. Design and operate pedestrian facilities to accommodate the handicapped.

In order to reduce the number of pedestrian accidents, design pedestrian facilities for safe use by handicapped people. Specifically, the designer should: provide

hand railings for outdoor stairs (1 case), provide proper illumination of indoor stairs (1 case), and eliminate irregular pavement surfaces (2 cases).

2a. Design vehicular traffic facilities for the safety of vehicular traffic and pedestrian traffic.

Consider pedestrian traffic as a significant factor in the design of a vehicular traffic facility. In many instances, pedestrians must interact with vehicles at these locations. Due to the pedestrian's disadvantages in size, weight, and energy, the pedestrian must be protected from the vehicle at all times.

Specific countermeasures in this general category are: locate crosswalks and bus stops on busy streets only where traffic control devices are present (6 cases), provide a stop line on the multilane approaches to busy pedestrian intersections (2 cases), and provide a clear and continuous pedestrian path across the intersection (2 cases).

Additional specific countermeasures include: examine the possibility of a traffic control device for locations with significant pedestrian movement across a busy street (1 case), provide adequate pedestrian crossing time at a signalized intersection (1 case), and provide a safe path for the pedestrian through a vehicular parking lot (1 case).

Finally, evaluate the initial countermeasures to make sure that they provide adequate protection for the pedestrian (1 case).

2b. Provide a safe school trip for young pedestrians.

Due to the number of trips made by these inexperienced pedestrians, the implementation of this countermeasure is very important. Specific countermeasures in this general category are: provide a safe route to school (1 case), eliminate or discourage unsafe routes (1 case), and insist that children who ride a bus to school follow proper safety procedures at the bus stop (1 case).

3. Provide an appropriate delineation or separation between pedestrian areas and nonpedestrian areas. Prevent interaction between the pedestrian and the vehicle if the interaction is unwarranted and dangerous.

Specific countermeasures proposed for accident sites in this project are: delineate the vehicular street from the adjacent parking lot by the use of a curb, sidewalk, or pavement marking (1 case); erect a fence to keep pedestrians outside the railroad right of way (1 case); separate the sidewalk from the street at dangerous locations, such as a small business district with no curb parking (1 case) or below the crest of a vertical curve (1 case).

4. Use traffic engineering countermeasures to insure that each street is used for its intended purpose.

Vehicular traffic must be discouraged from speeding through residential streets

where children frequently run into the street. One method available for implementation is the physical modification of the existing street network (2 cases).

Pedestrian Behavior

5. Provide information (particularly to children and the elderly) about safe and proper pedestrian behavior.

Children are not the only people who require education about pedestrian safety, all pedestrians are at risk. Elderly people particularly need to be retrained to cope with today's pedestrian environment. Faster vehicles, additional traffic, and new regulations, as well as the physical condition of the elderly person, create the need for a refresher course in proper pedestrian behavior.

An educational program for senior citizens should include the following lessons: how and why to look for vehicles while crossing a street (2 cases); how and why to avoid busy streets (1 case), slippery pavements (1 case), drainage gratings (1 case), and uneven pavements (2 cases); and how and why to avoid foolish actions, such as stepping down stairs backward (1 case).

6. Same as Countermeasure No. 5.
7. Same as Countermeasure No. 5.
8. Same as Countermeasure No. 5.

Enforcement

9. Prosecute dangerous drivers for the violation of traffic regulations.

The modification of pedestrian behavior cannot eliminate all pedestrian accidents. Some pedestrian accidents are strictly the fault of the driver; the pedestrian is not at fault and he is unable to take any evasive action. Some of these accidents can be eliminated by a modification of driver behavior. One way to modify the driver's behavior is by consistent prosecution of unsafe drivers.

Some of the dangerous violations which require more consistent enforcement and prosecution are: failure to yield to a pedestrian in a crosswalk (2 cases), stopping a vehicle in a crosswalk and backing a vehicle over a crosswalk (1 case), speeding (2 cases), and failure to obey a "STOP" sign (1 case).

Supervision and Education

- 10a. Encourage parents to take more responsibility for the supervision and education of their children.

Parents have very good opportunities and reasons for instructing their children

about proper pedestrian behavior. During the daily contact between parent and child, the parent has ample opportunity to teach and to demonstrate pedestrian safety. In addition to opportunity, the parent also has a responsibility to protect the child from dangerous situations. This responsibility includes an education in pedestrian safety.

Parents should teach their children: how to cross a busy street (6 cases); how to cross a street from behind a visual obstruction (1 case); why to cross in front of a stopped school bus (1 case); and why to wear corrective eyeglasses (1 case). While parents are teaching younger children (preschool age), supervision must be maintained (2 cases).

- 10b. Provide information to school children and safety personnel about safe and proper pedestrian behavior.

When the child goes to school a large portion of the general educational opportunity and responsibility goes with him. The schools should reiterate and continue the instruction started by the parents (7 cases). (See General Cause No. 6, Table No. 4). The school should emphasize safety during the school trip (3 cases).

Maintenance

11. Keep the pedestrian environment clean and free from debris.

In order to move people effectively and safely, pedestrian facilities must provide a clear path of travel. If the facilities are not properly maintained, the original design becomes hazardous and countermeasures are ineffective. Falling type accidents are the major result of a poorly maintained pedestrian facility.

This research shows two examples of improper maintenance: (1) grass and weeds growing over and through a pedestrian pavement (1 case), and (2) rainwater reacting with an unkempt greasy, oily pavement to produce a slippery and hazardous pedestrian surface (1 case).

12. Remove objects which obstruct visibility between driver and pedestrian.

To prevent places where pedestrians cross from being screened from driver's view by bushes, trees, etc., an effective maintenance program should clear these areas routinely; and arrangements should be made to have street furniture relocated to positions that do not interfere with sight lines.

Conclusions

The results of this research have provided the basis for the following conclusions. The conclusions are separated into two categories: those based on the research procedure and those based on the case studies.

Research Procedure

Sources

1. Hospital records are the best available source of information concerning nonvehicular pedestrian accidents. The availability of the hospital record on the day following the accident is a significant asset in contacting victims. Weaknesses in the process of using these records for the generation of pedestrian accident reports include: the inefficiency of collecting a large number of nonpedestrian accident reports, the absence of a definite accident location, and the absence of accident details. All of these weaknesses are results of the lack of appropriate information on the hospital record.
2. Police reports are the best source of information concerning accidents involving pedestrians and vehicles. Each report defines the exact location and the exact details of the accident. However, the use of the police reports also has three weak points. They are: the absence of the victim's telephone number, the long delay imposed between the time of the accident and the time of the possible interview, and the difficulty associated with the location of the pedestrian accident reports in the vehicular accident file.

Interviews

3. The telephone interview technique is a valuable tool for establishing the victim's verbal description of the accident.
4. The telephone interview technique is not particularly useful for the field study of an accident site. The victim's description of the accident site is frequently unclear or inaccurate. It is frequently improbable and occasionally impossible. The lack of visual contact between the interviewer and the victim undoubtedly contributes to this information gap.

Involvement

Elderly and handicapped people are involved in a significant portion of all pedestrian accidents. Subgroups of the handicapped population which show a high degree of involvement are: school age children, elderly people, and pre-school children. The absence of other subgroups from the pedestrian accident reports is particularly attributable to the inaccessibility of many pedestrian facilities.

Case Studies

The conclusions concerning the final results of this research are separated into two categories: causes and countermeasures. The major causes and countermeasures for the pedestrian accidents of the two significant and identifiable groups, the elderly and children, are also presented.

Causes

5. Many pedestrian accidents of handicapped people are caused by several contributing factors. Some of these general causes occur at the time of the accident; others occur over several years prior to the accident. Some of the causes are the fault of the pedestrian; others are not the fault of the pedestrian. Most of these causes can be reduced or eliminated by one or more countermeasures.
6. While the causes of pedestrian accidents of handicapped people are similar to the causes of pedestrian accidents of the general population, the handicapped are more susceptible to each of the causal mechanisms and more likely to be involved in each of the accident types.
7. The Elderly. The primary causes of pedestrian accidents of the elderly are the inadequate design of pedestrian facilities and the failure of the elderly to realize and adjust to their handicaps. Associated secondary causes include the failure to consider conflicting vehicular traffic while crossing the street and the failure to use the available pedestrian facilities.
8. Children. The failure of parents to provide proper supervision and education for their children is the primary cause of children's pedestrian accidents. The failure of the school to provide similar services is also a significant causal factor.

The child's lack of pedestrian safety education manifests itself in several dangerous pedestrian actions which cause accidents. They include: the failure to consider conflicting vehicular traffic prior to crossing the street, the failure to consider conflicting vehicular traffic while crossing the street, and the failure to use the available pedestrian facilities.

9. Other groups of handicapped people. Any conclusions about the causal factors of any other group of handicapped people would be presumptuous due to the limited number of accident reports.
10. All handicapped people. A major causal factor of the pedestrian accidents of all handicapped (and all nonhandicapped) people is the ineffectiveness and/or unreliability of present pedestrian facilities.

Countermeasures

11. The solutions to many pedestrian accident problems are composed of several countermeasures. Each of these countermeasures must be coordinated with the others to provide an effective solution.
12. The design of pedestrian facilities and the implementation of physical design countermeasures must consider the characteristics of the handicapped person.

13. Elderly. The two primary countermeasures for the reduction of pedestrian accidents of elderly people are: (1) the modification of the design of pedestrian facilities to accommodate elderly people, and (2) the education of elderly people concerning safe pedestrian behavior.

The characteristics of elderly people should be considered from a physical perspective and a psychological perspective. Important physical characteristics include failing eyesight, and a slow, shuffling walk. The elderly person's inability to make quick or complicated decisions are important psychological factors. Educational programs should teach the elderly person how to adjust to his handicap. Critical pedestrian behavior patterns, such as how and where to cross a street, should be emphasized.

14. Children. A reduction in the number of pedestrian accidents involving children can be most effectively accomplished with an educational process. The parents and the schools must cooperate in this instruction of proper pedestrian behavior. The individual lessons should include: how to look for conflicting vehicles prior to crossing the street, how to look for conflicting vehicles while crossing the street, and how to use the available pedestrian facilities.
15. All handicapped people. All physical design countermeasures for the reduction of pedestrian accidents of handicapped people (and nonhandicapped people) must be effective and reliable. If the countermeasures do not meet these criteria, they are of little practical value.

the five city accident survey

Police and hospital emergency room records provide a useful indication of pedestrian accidents, but neither source is wholly satisfactory. In the first place, police intervention occurs in a small fraction of pedestrian accidents, and the overwhelming majority of pedestrian accidents that are reported to the police involve motor vehicles; few other types of pedestrian accidents are reported to the police. Hospital emergency rooms, on the other hand, treat people injured in all types of accidents, but many accidents are not severe enough to require the victim to have emergency room treatment, and many accident victims are treated at doctors' offices and at other healthcare locations. And finally, accidents in which the handicapped are involved are a relatively small proportion of the total, so many records must be scanned in order to turn up these few accidents.

The Atlanta accident studies described earlier suffer from these limitations. Most of the accidents involved vehicles—few non-vehicular accidents were reported. Furthermore, most of the accidents involved the elderly and children; few accidents involving other groups of handicapped people turned up in the sample investigated.

For these reasons, it was necessary to try to obtain additional information on non-vehicular accidents, particularly those in which handicapped people are involved. As

discussed earlier, there is little in the literature that is useful, so it was decided to gather additional information as part of a survey conducted in five U.S. cities.

The primary function of the Five-City Survey was to identify the environmental problems, rather than hazards, experienced by elderly and handicapped pedestrians. Nevertheless, the nature of the survey made it possible to include questions on accidents. The survey was conducted in five cities chosen for their climatic, topographic, regional, social and economic differences (San Francisco, Seattle, Chicago, Tampa/St. Petersburg, Atlanta). A fuller description of the (problems) survey, including the techniques used and the findings, are included in Part 2 of this volume, "Environmental barriers and problems."

For the surveys, a focused interview technique was used. The interviewer did not attempt to control the conversation except to introduce, from time to time, new topics drawn from a pre-determined check list. As part of this check list, the subjects were asked if they had been involved in any pedestrian accidents. If the answer was affirmative, then the interviewer used a special form (see Appendix A, this is the same form used for the Atlanta accident survey), and probed the nature and cause of the accident as described by the victim. The victim's responses were entered on the form, and with permission, the interviews were also tape recorded; these recordings were used later to elucidate and elaborate on the written notes.

The subjects that were interviewed were elderly and handicapped people who were identified for the project team by more than eighty local social and health service agencies, community associations and organizations representing elderly and other disability groups.

Results

A total of 338 people were interviewed—92 in Tampa/St. Petersburg, 73 in Chicago, 67 in San Francisco, 65 in Seattle and 41 in Atlanta (see Appendix C). And 174 of these people reported involvement in pedestrian accidents that fall within the scope of this study—pedestrian accidents that occurred in or out-of-doors, but not in domestic kitchens, bathrooms, bedrooms, living rooms, offices, etc.; in other words, accidents that occurred within the pedestrian movement system.

The high percentage of subjects that reported accidents can probably be explained by the ground rules of the survey. The subjects were encouraged to discuss any pedestrian accidents that they had experienced within the period in which they had their present handicap. And secondly, they were encouraged to discuss even those accidents where no serious injury had eventuated. The purpose of the survey was to find out the types and causes of accidents experienced by the various groups, so the date of the accident and the severity of the injury was unimportant.

Table 5 shows the percentage of subjects in each disability group that reported an accident. From these data it can be seen that four of the groups reported 70% of the 174 accidents, and the highest percentage of reported accidents, and in these terms can be considered to be the higher risk groups.

- Developmentally restricted (77% reported accidents).
- Wheelchair users (63% reported accidents).
- Those with lower extremity impairments who walk using special aids (75% reported accidents).
- Severely visually impaired (62% reported accidents).

Table 6 presents a cumulative summary of the accident data from the five cities. Data from each of the five cities individually can be found in Appendix C.

Table 5: Accident Reportage by Various Handicap Groups

	Subjects Interviewed	Accidents Reported	Percentage Reporting Accidents
Developmental Restrictions	13	10	77
Chronic Restrictions (agility/stamina/ reaction time)	40	21	53
Wheelchair Users	62	39	63
Walks w/ Special Aids	57	43	75
Walks w/Difficulty	36	8	22
Upper Extremities	8	3	38
Severe Auditory Impairment	38	8	21
Severe Visual Impairment	52	32	62
Confused/ Disoriented	32	10	31
Totals	338	174	51

Table 6: Survey of Pedestrian Accidents Involving the Elderly and Handicapped:
5 Cities Total (174 Subjects)

Handicap	Age		Sex				Type	Component					Accident																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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Table 7 is based on Table 6 and indicates, for each handicapped group, the types of accidents that they reported. Thus we find that 40% of all the accidents reported by people with developmental disabilities were falls on the level; 30% were falls while changing level (steps, ramps, etc.); and 30% were accidents involving motor vehicles. From Table 7 it can be seen that nearly half (47%) of all the accidents reported occurred while the victim was traveling on level surfaces. Another 32% occurred while the victim was ascending or descending from one level to another. And 20% were accidents in which vehicles were involved.

Table 7: Percentage of Accidents by Type of Handicap

	Falls on Level	Falls Changing Level	Hit by Vehicle	Pedestrian and Pedestrian*
Developmental Restrictions	40	30	30	0
Chronic Restrictions (agility/stamina/ reaction time)	48	38	14	0
Wheelchair Users	64	28	5	3
Walks w/ Special Aids	51	35	12	2
Walks w/Difficulty	38	13	50	0
Upper Extremities	0	33	67	0
Severe Auditory Impairment	50	25	25	0
Severe Visual Impairment	28	44	25	3
Confused/ Disoriented	40	10	50	0
Totals (all Subjects)	47	32	20	2

*Accident resulted from contact with another pedestrian

The accident patterns of some handicapped groups differ markedly from that of the whole group. The reports from:

- the developmentally disabled show that 40% of the accidents involved vehicles. This is not altogether unexpected, as this group consists mostly of children, and children tend to be over represented in pedestrian/vehicular accident reports;
- the wheelchair users show that 64% of their accidents occurred on level walkways;
- people who walk with difficulty but without the use of special aids show that 50% of their accidents involved vehicles;
- those with severe visual impairments show that 44% of their accidents were falls at walkway level changes; and
- the confused/disoriented group show that 50% of their accidents involved motor vehicles.

In Table 6 the environmental components and elements where the accidents occurred are listed. For the purposes of this study, an element is an individual piece of the pedestrian system; i.e., a curb ramp, a stair, a bench, a crosswalk, etc. A component is a grouping of elements which forms one part of a system; i.e., a street crossing is a component, and it may consist of the following elements: curb ramps, signals, signs, crosswalk, etc.

From Table 6 it can be seen that 160 (92%) of all the accidents occurred on four of the components--walkways 21 (39%), street intersections 51 (29%), public spaces/parks 17 (10%), building entrances/lobbies 24 (14%).

And from Table 6 it can be seen that 142 (82%) of all accidents occurred on only four of the elements:

- 63 (36%) of all the accidents were falls on walks and corridors--slips on ice and snow or on slick surfaces, trips on badly maintained surfaces, falls caused by unexpected potholes, etc.;
- 29 (17%) of the accidents occurred while crossing the street--approximately the same percentage that were involved in accidents with motor vehicles;
- 20 (11%) of the accidents occurred at curbs or curb cuts;
- 30 (17%) of the accidents occurred on stairs. This is not unexpected. From the evidence of the U.S. Consumer Product Safety Commission,²⁵ stairs are the most dangerous consumer product.

A further examination indicates that the accidents experienced by some handicapped groups occurred predominantly on particular environmental elements.

- Developmental disabled--4 (40%) of the accidents occurred on walkways and corridors.
- Wheelchairs--19 (56%) of the accidents occurred on walkways and corridors; 7 (18%) on curbs and curb ramps.
- People who walk with aids--17 (40%) of the accidents occurred on walkways and corridors; 8 (20%) on stairs, and 7 (14%) at curbs and curb cuts.
- Visually impaired--10 (31%) of the accidents occurring at stairs, 7 (22%) on walkways and corridors, 6 (19%) at curbs and curb cuts.

These are the same four handicapped groups that were identified earlier as being the higher risk groups.

Conclusions

From the survey it can be concluded that four of the handicapped groups can be classified as experiencing higher risks in terms of accident probability.

- Developmentally restricted (mostly children)
- Wheelchair users
- Those with lower extremity impairments who walk using special aids
- Severely visually impaired

Three types of accidents predominated:

- Falls on the level (47% of all accidents). 64% of all wheelchair accidents occurred on the level.
- Falls at level changes (32% of all accidents). 44% of all accidents involving the visually impaired occurred at level changes.
- Accidents involving motor vehicles (20% of all accidents). 40% of accidents to the developmentally disabled, and 50% of accidents to those who walk with difficulty but without the use of special aids, and to those who are confused and disoriented, involved motor vehicles.

Four pedestrian environment components were the loci for 92% of all the accidents:

- walkways (39%)
- street intersections (29%)

- public spaces, parks (10%)
- building entrances, lobbies (14%)

And four pedestrian environment elements were the loci for 82% of all the accidents reported.

- Walks and corridors (36%)
 - 40% of all reported accidents to the developmentally disabled
 - 56% of all reported accidents to people who use walking aids
 - 40% of all reported accidents to people who use walking aids
 - 22% of all reported accidents to visually impaired people
- Street crosswalks (17%)
- Curbs, curb ramps (11%)
 - 18% of all reported accidents by wheelchair users
 - 14% of all reported accidents by people who use walking aids
 - 19% of all reported accidents by visually impaired people
- Stairs (17%)
 - 20% of all reported accidents by people who use walking aids
 - 31% of all reported accidents by visually impaired people.

summary of accident studies

The causes of the accidents in which elderly and handicapped pedestrians were injured can be grouped into five categories.

- Transportation planning failures
- Environmental design failures
- Environmental maintenance failures
- Pedestrian behavioral errors
- Driver behavioral errors.

Transportation planning failures are of three types:

1. The failure to develop traffic plans for pedestrians, and particularly for elderly and handicapped pedestrians. This comment reflects the fact that usually traffic plans for cities are primarily for vehicles. The large percentage of pedestrian accidents could be reduced by implementing planned pedestrian networks in cities.
2. The failure to consider the pedestrian (particularly the elderly and handicapped) adequately in the design of vehicular traffic facilities. Examples include streets without sidewalks; bus stops at busy intersections without crosswalks; crosswalks in busy streets without traffic control devices; insufficient time permitted for crossing at traffic signals, etc.
3. The failure to ensure that streets are used for their intended purpose. Pedestrians expect expressways to be used for high speed traffic; arterials for medium speed through traffic, and local streets for low speed local traffic. When these expectations are violated, the pedestrian becomes more vulnerable.

Environmental design failures include failures of the components of the pedestrian movement system, and the elements from which they are composed. There are four environmental components that were the loci for most of the accidents:

1. Walkways
2. Street intersections
3. Public spaces/parks/recreation areas
4. Building entrances/lobbies

and four elements within these components that were the loci for most of the accidents.

1. Walks and corridors. The lack of adequate separation or delineation between pedestrian and vehicular areas. Children, the elderly, and the visually handicapped wander off the pedestrian space into the vehicular way and are struck. Examples include the lack of delineation between a busy street and a sidewalk and between pedestrian and vehicular routes in parking lots.

Other walkway hazards include unprotected building and repair sites, surfaces that are slippery or have tripping hazards.

2. Street crosswalks. Design failures include the failure to provide stop lines and wide enough crosswalks; the location of trees and planting, poles, parked cars and other impediments that prevent drivers from having a good view of pedestrians preparing to cross; the presence of gratings, manhole covers, etc., in the crosswalk that may cause a slip or trip.
3. Curbs, curb ramps. The failure to provide curb ramps; the provision of poorly designed and incorrectly located curb ramps; the use of very high and very low

curbs, and curbs that present tripping hazards; the location of drainage outlets and slippery gutters, etc., all contribute to the design problems of these elements.

4. Stairs. The failure to design and locate stairs such that the inherent hazards can be reduced to a minimum. Implicit in the problem is the location of steps, stairs, ramps, and other abrupt level changes where people with poor sight may fail to detect them. Stair design failures may include incorrect riser/tread proportions, handrails that are too high, too low, or not provided at all; inadequate or poorly conceived illumination, etc.

Environmental maintenance failures include the failure to keep the pedestrian environment clear and free from debris and free from slippery conditions caused by water, or a greasy and oily pavement; grass and weeds growing on the surface, cracked and irregular sidewalk paving, potholes, puddles, snow and ice, etc.

Pedestrian behavioral errors typically include:

1. The failure to consider traffic prior to entry into a street: children run into the street or into the path of a vehicle in a parking lot. The problem may be compounded by a visual obstruction such as a telephone pole or a moving bus.
2. The failure to consider conflicting vehicular traffic while crossing the street: the pedestrian observes the traffic before starting to cross, but fails to look for traffic while crossing. Slow-moving elderly people were involved in the accidents we studied. Examples include pedestrians mistakenly assuming that drivers will yield the right of way in crosswalks; pedestrians' failure to consider the second or third lane of traffic in a multilane street; and the inability of the pedestrian to move quickly out of the street when a vehicle is sighted.
3. The failure of the pedestrian to use the available street-crossing facilities: the victim follows a path of convenience and crosses away from a crosswalk. Both elderly people and children are involved in accidents of this type.
4. The failure of the elderly to realize and adapt to their decreased mobility: examples include their failure to realize that they walk more slowly than they used to and that they take longer to cross the street and their failure to avoid busy streets, slippery pavements, irregular pavements, drainage gratings, and so forth, all of which make walking hazardous.

Driver behavioral errors include a failure to yield the right of way to a pedestrian in a crosswalk, stopping a vehicle in a crosswalk, speeding, failure to observe a stop sign, and so forth.

In Part 1, the nature and causes of accidents experienced by the elderly and handicapped pedestrian have been presented. Part 2 will discuss the problems and barriers this group experienced in trying to overcome impediments in the pedestrian environment.

introduction

The pedestrian environment has evolved without sufficient attention given to the needs of people who are not young, able bodied adults. It would seem that the sidewalks, paths, walkways, crosswalks, and parks were conceived by planners for the needs of some 'average' person—someone who is of 'normal' adult proportions, and who has 'normal' adult proportions, and who has 'normal' perceptual, mental, and physical equipment and abilities. Obviously, this describes quite a small cross section of humankind. It excludes, by definition, children, those whose abilities are not 'normal'; and the elderly, whose abilities have deteriorated over time.

This very limited conception of the 'average' pedestrian is obviously not a conscious attempt to discriminate. Nor is it simply a callous disregard for others. It is largely the result of being unaware. The urban policy makers and designers have, until recently, been unaware that their decisions cause problems. They have been unaware of the nature of the special needs of people other than 'normal' people.

These design failures are easier to understand when we examine the planning reference sources that are available to professionals, for these sources provide little assistance. In fact, there are no sources that treat the subject adequately. And this is not surprising because, before design recommendations can be set out, it is necessary to seek out the problems and then develop solutions that will work for this much larger population.

An exacerbating factor is that the pedestrian environment is seldom planned. It usually occurs as an adjunct to some other planned activity—sidewalks and adjoining roads, walkways through plazas and parks etc. The sidewalks and crosswalks are considered as necessary provisions for a successful vehicular traffic plan. But pedestrian traffic planning is almost non existent.

For these reasons, the elderly and handicapped must try to negotiate a pedestrian environment that does not match their abilities. For some of them, parts of the environment are impossible; and for some, the environment is replete with unnecessary obstacles.

The elderly and handicapped are not a homogenous group. They differ in their abilities and disabilities. In this part of the report, the target group are examined - the types of disability that handicap them, the numbers of people affected, and the nature of the problems and barriers that confront them in the pedestrian environment.

"Risk Population Among Pedestrians," discussed later in this part is directed at estimating the numbers of elderly and handicapped people that are likely to be affected by the pedestrian environment. "Environmental Problems for Elderly and Handicapped Pedestrians," reports on the results of a survey to find the problems and barriers that most frequently cause difficulties or prevent the target group from using parts of the towns in which they live.

As a first step to understanding the problems, it is necessary to identify the types of human condition that separate the elderly and handicapped from the designers 'normal' person. As discussed earlier, we fail to provide for a wide enough cross section of human kind because we tend to design for a hypothetical person who has no apparent mobility limitations to using the pedestrian environment. The question that must now be addressed is what do we mean by 'handicapped' in the pedestrian sense. We usually think immediately of people who are visually impaired, and people who are in wheelchairs. But there are many other handicapping conditions, many of which are an inevitable part of the process of human existence. Children and the elderly, for example, have unusual difficulty in using the present pedestrian environment, and this is demonstrated by the fact that they tend to be disproportionately over represented in accident statistics.

Classification and Definitions

The terminology and criteria used in the literature to identify the elderly and the handicapped tends to be inconsistent and impermanent, and often reflects the objectives of whoever is promoting the definitions. Those groups or agencies that are primarily concerned with compensation or benefits for the handicapped tend to rely on medical diagnoses and definitions. For our purposes, this is not satisfactory for several reasons. First, any given medical condition may result in a variety of functional disabilities, each of which may or may not handicap the patient as a pedestrian. Second, the medical condition may have various degrees of severity, some of which may handicap the patient.

A different direction is taken by those primarily concerned with rehabilitation. As their objectives are aimed at restoring or retraining the patient for vocational, educational, or at least home-related activities, the degree of handicap is often based on their ability to perform in these settings. Once again, these criteria are inadequate for this study.

A somewhat similar approach was chosen by ABT Associates (1968) for their investigation of travel barriers. They listed the activities that people would need to be capable of in order to be able to use various transit modes. These people should be able to: "walk more than one block," "move in crowds," "stand or wait," and "climb steep or long stairs," etc. For our purposes, to attempt to set out a compendium of functional requirements in this fashion would be to make assumptions on factors that are central to the research. It is our responsibility to seek out and identify these "functional imperatives" in terms of the problems and hazards they present to the target population.

For these reasons, we have chosen to avoid using the causes (congenital, traumatic or medical) as criteria, and we have avoided attempting to define functional requirements for pedestrian travel.

If we assume, as discussed earlier, that the pedestrian environment is intended for 'normal, healthy adults in their prime,' then these are people of 'normal stature and dimensions' with 'normal perceptions and reactions' with 'normal agility and stamina' and whose physical equipment can cope with pedestrian activities with little difficulty. The remainder of the population is, therefore, by this definition, handicapped as pedestrians. Their dimensions, agility, reactions and bodily equipment are impaired or inadequately developed to operate as a pedestrian in the present environment without difficulty or greater than normal danger.

We can then specify the performance levels of the main physical and mental attributes necessary for 'normal pedestrian movement,' and conclude that unless the levels are reached, the subject is handicapped. We can classify them into the following handicapped groups relating to:

- a) Size and maturity
- b) Agility, stamina and reaction time
- c) The use of their legs
- d) Their arms, shoulders and neck
- e) Their hearing
- f) Their sight
- g) Their mental condition.

Statistical information is available to enable us to further sub-divide those with lower extremity impairments into three groups, and those with developmental restrictions into two groups. Using this method, we have developed a classification of ten subgroups, as shown in Table 8.

Table 8: Classification of Handicapped Groups

Attribute	Handicap	Sub-Group
A. Size and maturity	Developmental restrictions	1. Pre-school children 2. School-age children
B. Agility, stamina and reaction time	Chronic restrictive conditions related to agility, stamina, and reaction time	3. Persons over 65
C. Legs	Lower extremity impairment	4. Confined to wheelchair 5. Walking using special aids 6. Walking with difficulty without the use of special aids
D. Arms and shoulders	Chronic impairment of upper extremities and shoulders	7. Chronic impairment of upper extremities and shoulders
E. Hearing	Severe auditory impairment	8. Severe auditory impairment
F. Sight	Severe visual impairment	9. Severe visual impairment
G. Mental condition	Obvious confusion, and/or disorientation	10. Obvious confusion and/or disorientation

Some further explanation of this classification system is necessary.

Subgroup A—Size and maturity

This group includes all those whose size is smaller or larger than the average able bodied adult. Members of this group may not be able to reach most handrails, pay telephones, etc.; and cannot easily use steps and stairs because their legs are too short; and, because of their small stature, they will be less visible to vehicle drivers.

We also must include those who are too large, for whom there is often insufficient headroom; or because of obesity or advanced pregnancy, need more space than usual.

And we include here development immaturity in terms of childish behavior; the inability to discriminate sufficiently between dangerous and safe activities, to exercise forethought in using the pedestrian environment alone, and to cross vehicular roads without assistance, for example.

Typically, we find in this group pre-school and school age children, dwarfs, giants, obese people, women in advanced stages of pregnancy, etc. This is not an exhaustive list. It is not difficult to derive estimates of the population of children, but very much more difficult to identify reliable figures for the other members of this group. Therefore, only the figures for pre-school and school age children have been estimated.

Subgroup B--Agility, stamina and reaction time

This group includes those whose difficulty in negotiating the pedestrian environment is derived from a substantially reduced degree of agility, stamina and reaction time. Members of this group may have particular difficulty in crossing the street in the time allotted by the traffic signals; they may be unable to travel more than a short distance without the need to sit or to rest; they may react dangerously slowly to oncoming vehicles; they may have arthritic or stiff joints which make it difficult for them to climb steps, operate door knobs, etc.

Typically, these are degenerative conditions that accompany the normal process of aging, and the predominant group is those who are elderly--those who are 65 and over. These conditions may, of course, be present in people of any age; however, because adequate data on these people is not available, for the purposes of this study, population estimated on the former group only, have been obtained.

Subgroup C--Lower extremity impairment

This group includes those with a wide variety of lower extremity impairments and can conveniently be subdivided into three sections for which statistical data is available.

Wheelchair users

Many medical conditions may limit a person to the use of a wheelchair for moving from place to place, and medical considerations control the type of wheelchair used. The most important of these is whether the subject has powerful upper limbs and can propel the wheelchair freely over flat ground. If this is feasible, then the chair user should be able to negotiate most pedestrian ways except stairs and very rough or soft ground. If the user does not have powerful upper limbs, then an attendant may be required to push the wheelchair, or an electronic motor to drive it.

If there is an attendant, then it is obvious that much of the work usually performed by a wheelchair user with powerful arms is compensated for by the attendant, and indeed, the attendant might perform other services as well.

The most common medical condition where the patient retains powerful upper limbs and can manipulate a wheelchair but cannot walk, is paraplegia, a spinal cord injury that

paralyzes below the waist. These people may drive hand operated cars, managing to get in and out of their car, collapsing their wheelchair and lifting it into the back seat.

Other types of conditions occur where the upper limbs are capable of manipulating a wheelchair, e.g., traumatic conditions involving only the lower limbs, arthritis involving only the lower limbs, and poliomyelitis.

People with severe brain damage, e.g., cerebral palsy, stroke, multiple sclerosis, may depend entirely upon attendants or electric motors with minimal control necessary by the patient, for propulsion. To operate electric motors, a quadriplegic who has had injury to the spinal cord in the neck region must, at least, have the use of an upper limb in order to control the joystick of his machine. However, a limited number of people have now been provided with devices that are controlled by transducers in the facial region that can be controlled by blowing, eye movement, head movement, etc.

Walking using special aids

This subgroup includes people with impairments of the lower extremities which severely handicap them but do not mandate the use of a wheelchair. It implies that these people can use their own lower limbs with the supplement of special aids. These include braces (both long and shortleg braces), prostheses ("artificial legs"), and crutches for both support and propulsion. People who use canes for support are not included in this group.

Leg Braces. The majority of bracing of the leg that still permits walking involves paralysis due to diseases and injuries of both the central nervous system and the peripheral nervous system. With injury or disease of the brain and spinal cord, many people are so severely disabled that they can never walk at all, but many others are able to do so with braces to maintain the knee joint and the ankle joint in a firm embrace, prohibiting collapse of these joints. With the stiffening provided, these people are capable of swinging their limb and producing a modified gait which is, in spite of its much greater demand of emotional and physical effort, successful in propelling them for distances varying from a few paces to possibly several miles. Such people have some difficulty in negotiating stairs in and out of buildings as well as in public transportation situations. However, many drive cars daily.

Conditions in which the above circumstances obtain include the following:

a. Central Nervous System.

Stroke (cerebrovascular accident) where the paralytic condition is usually confined to half the body (hemiplegia) and is complicated by involvement of the upper limbs and sometimes speech and cognition even in the ambulant patient. A further complication is the existence of spasticity which makes the paralysis even more awkward.

Cerebral Palsy often consists of gross disturbance of locomotion which may be complicated with gross abnormalities of upper limb function, and, in many cases, with mental retardation. Where locomotion is possible with special aids, these are

normally canes or braces. Their functions are to support the body during gait.

Infections (e.g., brain abscesses, encephalitis). These may result in problems similar to the above (hemiplegia) or more severe involvements. Recovery may be complete; however, some patients will have limitations similar to those noted above for the stroke patient.

Multiple Sclerosis and Related Spinal Cord Diseases. This group of diseases are of obscure etiology. Many of them are progressive and the victim passes from a period of slight impairment to very severe impairment. In the interval, many such patients manage to walk with bracing of their lower limb to prevent collapse of the major joints because of muscle weakness.

b. Peripheral Nervous System.

Poliomyelitis, until the 1960's a cause of many patients requiring lower limb bracing, now affects very few new cases this way. However, there are many thousands of Americans who manage to go about their daily business with small to large metallic bracings of their lower limbs (one or both). Some of these people walk with a slight limp; others have considerable difficulty in walking and supplement their bracing with canes and crutches.

Peripheral Nerve Injuries and Diseases. Inflammation of nerves (neuritis) may result in temporary or permanent paralysis of the lower limbs and require treatment by bracing similar to what has been mentioned. Nerve injuries due to trauma would have the same effect.

Neurological conditions may require the victim to walk with the aid of a cane or canes as support for the weak limb or limbs. This support compensates for the mild to moderate weakness. If the limbs are very weak, crutches are used as the prime swingthrough lever. With both crutches and canes, the patient may require bracing as well. Again, the involvement of other parts of the body may dictate whether the whole approach is feasible.

c. Bones, Joints and Muscles.

Traumatic Conditions. Accidents can produce all of the disabilities in locomotion that nerve damage can produce. In addition to instability, however, accidents can produce severe restrictions of motion where the hip joint and/or knee joint and/or ankle and foot will not move in the proper sequence. Further, severe pain may restrict mobility and speed of movement. Braces are used to attempt to compensate for all of these problems. If the condition is an acute one, instead of braces, plaster casts are employed as a temporary device. People in splints and plaster casts usually must also have canes or crutches and their range of limitation varies from barely mobile to aggressively active.

Arthritic Conditions. Two major subdivisions of arthritis affect the public—rheumatoid arthritis and osteoarthritis. The former is common in middle age and

the latter becomes progressively more disabling in older people. Almost all elderly people have some degree of osteoarthritis and many are severely disabled by it. Not only is pain in major joints an important deterrent to walking, but also the joints become progressively stiffer and unresponsive so that the patient is slowed down by both physical restrictions and fear of pain. Braces are seldom used in such conditions, but canes and crutches are a commonly used resource for the patient with arthritis.

Environmental Conditions and Boundaries Affecting Patients in Subgroup 5

For all people who walk with special aids, the environment is most favorable where it is flat, not slippery, and provides for safe rest stops and maximum assistance in counteracting gravity (elevators). It is most threatening where the ground is slippery, rough, includes stairs as the only method of ascent and descent, and is hostile to those who must stop and rest often (e.g., crossing a wide street or negotiating passage through a milling crowd). Fatigue is an obvious problem for all such people. The pace of normal activity in getting in and out of private transportation and public transportation is usually much slower.

Walking with difficulty using canes or walking sticks

The conditions mentioned in Subgroup 5 all obtain in Subgroup 6, along with some other mild problems of secondary importance; it is just a matter of degree. Some people prefer not to use braces or crutches. Others have had inadequate medical care or simply cannot afford the devices. Many persons in the latter group may be as severely disabled as patients in Subgroup 5, and probably could benefit from the use of special aids.

Subgroup D—Chronic impairment of upperneck and shoulders

The medical conditions that produce chronic impairments of the upper extremities and shoulders embrace the same systems and disease processes that affect the lower extremities. Impairment of grasp, and pain during elevation of the limb while manipulating handles, etc., are typical manifestations. And the problem is magnified when it is accompanied by serious lower limb impairments.

Many parts of the environment are controlled by objects that require handling before one can proceed. These objects have been designed for 'normal' people with sufficient muscular strength to press up or down on a bar, to turn a handle, to manipulate with precision; and this requires the ability to grasp and the pronation/supination of the forearm. And in many cases, the devices are overhead, where the subject cannot reach them because of weakness or pain.

Subgroup E—Severe auditory impairment

Severe auditory impairment to the point of 'deafness' arises from many conditions involving diseases of the middle ear and the inner ear 'neural deafness.' Middle ear deafness is decreasing in importance in America because its most common source is

infection, particularly in childhood. Nevertheless, it still occurs among the poor. Its final influence on citizens negotiating the environment is no different than neural deafness. The cause of neural deafness is not precise, many cases being considered 'idiopathic' (no known cause). While deafness can be compensated for by hearing aids, some frequencies in the sound cycle are not properly transmitted to the brain through a hearing aid.

The degree of hearing loss is important here because, obviously, there is a relationship between the severity of the impairment and the handicapping effect. As discussed later, the statistics used for this report are based on the Health Interview Survey for the Bureau of the Census. And this survey differentiates between monaural and binaural hearing loss and between persons who:

- cannot hear and understand spoken words
- can hear and understand a few spoken words
- can hear and understand most spoken words.

For the purposes of this study, only people with binaural hearing loss have been counted, and only people in the first two categories above.

Subgroup F—Severe visual impairment

Visual impairment at any level can occur because of disease of the eye in childhood. In later life, inflammatory conditions due to infection and unknown causes can cause visual impairment. Probably the most severe visual impairments can occur at any age and can be classified as errors of refraction. Fortunately, these errors of refraction can be compensated for in most people with proper lenses. The truly severe visual impairments that pose a danger to the individual are those which approach blindness in the legal sense. Cataract, which is common among the elderly is a clouding of the lens of the eye. It requires surgical removal of the density from the lens after which the patient must wear special lenses. However, in spite of the excellent treatment of cataract, elderly patients wearing their thick lenses after cataract surgery are severely annoyed by the fact that they cannot see what lies at their feet as they walk.

As with many disabilities, the severity of the impairment varies and the handicapping effect also. As discussed later, for this study, it is necessary to differentiate between monocular and binocular impairment. For the purposes of this study, only those with binocular impairments were counted, and of these, only those 'who cannot see features or moving objects.'

Subgroup G—Obvious confusion or disorientation

At any age, organic or mental conditions may lead to obvious confusion, mental disequilibrium, and/or disorientation. These conditions can arise from immaturity, mental illness, organic brain conditions, alcoholism, drug intoxication, and neuroses. Mental retardation is widespread, and an I.Q. below 35 implies an intelligence of a small

child in the body of someone who might be quite adult physically. At the other end of the scale, the term 'senility' is often used to define mental deterioration. This is due to organic degeneration of brain cells with increasing age. Alcohol and certain drugs, many of the latter being prescription drugs given by treatment of some condition in the patient, grossly reduce the performance of people in the environment; and many persons under the effect of alcohol, hard drugs, and prescription drugs for treatment, do not appreciate their reduced performance and judgement level.

The pedestrian environment makes very little allowance for those citizens who venture into it with less than normal reflexes, normal intelligence, normal reaction time, and normal judgement. Many such persons cannot understand signals, let alone read signs, while the switch to signs that employ symbols is a slight improvement; their major advantage is the speed of comprehension by normal people. Symbols are often just as difficult for the mentally ill and mentally incompetent to understand as written words are.

risk population—among pedestrians

Introduction

By definition, a pedestrian is an individual traveling on foot. Excluding those who drive or ride motorized or non-motorized vehicles, there are other users of the road besides able-bodied pedestrians.

There are also those who, to some degree, lack the ability to walk as easily as a supposedly normal person. These people move with some difficulty with or without any aid, mechanical or otherwise, and this difficulty is commonly regarded as disabling.²⁶

The present investigation is designed to determine the risks and problems experienced by this latter group in pedestrian locomotion.

Ambulation has attendant risks, with characteristic differentials to disparate groups of people in different places. Any attempt to measure these differentials should logically be dependent upon a proper identification of these groups and estimates of their numbers. It is only after such an undertaking has been completed that subsequent estimates of proportions among these different categories in different locations can be derived. The present investigation deals primarily with the estimates of group numbers.

Population at Risk

To identify the different categories among the population characterized by differentials in the risks involved in locomotion, it was felt that certain significant categories of disabilities should be examined separately. The possibility of somewhat higher risks among older and younger population, disabled or not, as well as among those who are mentally unstable, (as discussed earlier) was also recognized and it was agreed to obtain statistics for the following ten subgroups:

1. Preschool children (population under 6 years of age).
2. School-age children (population 6-17 years of age).
3. Older people (population 65 years and over).
4. Wheelchair users.
5. Walking with special aids (artificial arm or leg, braces, crutches, special shoes, walker, etc.).
6. Walking with difficulty (use cane or walking stick).
7. Chronic impairment of upper extremities and shoulders.
8. Severe auditory impairments (cannot, or have difficulty in hearing or understanding spoken words).
9. Severe visual impairments (legally blind and those who can read newsprint but cannot see features and/or moving objects).
10. Obvious confusion and/or disorientation (including alcoholism, drug dependence and mental illness).

The first three are merely age categories, and from that point of view are mutually exclusive among themselves. The remaining seven represent types of disabling conditions which significantly impede a person's ability to move around, and in fact, are the most prevalent of the disabling conditions. Obviously, a person may suffer from more than one disabling condition, and therefore these categories are not mutually exclusive among themselves. This fact is worth noting since an estimate of the numbers of disabled population cannot be obtained simply by adding the estimates of the individual disabling conditions.

Estimates by Categories

The U.S. Department of Health, Education and Welfare (DHEW) conducts periodical surveys of non-institutional populations through random samples of households, for estimating the composition of population by various disabling conditions and other associated variables, some of which are used for cross-classification. Tables with short reports are published in Vital and Health Statistics. Data from the National Health Survey of DHEW reports (for subgroups 4-9) and the 1970 Census report (for subgroups 1-3) and other publications (for subgroups 9 and 10), were used to generate estimates of subgroup totals shown in Table 9.

These estimates (Col. 2) refer to different time periods and therefore correspond to different base populations. Estimates for the calendar year 1975 (Col. 3) have been obtained by assuming that the respective disability rates have remained the same during this period. In other words, the figures in Col. 2 are multiplied by the ratios of

population size in 1975 to those in the base periods of respective estimates, to generate Col. 3 (see Appendix D for population composition by sex, age and rural-urban areas for 1970).

From Table 9, and at the risk of double counting, the disabled population in 1975 can thus be estimated as over 12 million. In percentage terms, the figure is of the order of 6 percent, and surprising as it may seem, it is apparent that one out of every 16 or 17 persons in the U.S. has a major handicap which acts as a deterrent to locomotion.

Table 9: Estimated Distribution of Risk Population by Major Groups

DESCRIPTION OF GROUPS (Col. 1)	ESTIMATED POPULATION (000)		NUMBER PER 1,000 POPULATION (Col. 4)
	Around 1970 (Co. 2)	Around 1975 (Col.3)	
1. Preschool Children (under 6)	20,965 ^a	20,926	97.50
2. School-age Children (6-17)	48,679 ^a	46,482	216.57
3. Older people (65 and over)	20,065 ^a	22,170	103.30
4. Wheelchair users	409 ^b	445	2.07
5. Walking with special aids	4,638 ^b	5,042	23.49
6. Walking with difficulty	2,156 ^b	2,344	10.92
7. Chronic impairment of upper extremities and shoulders	2,440 ^c	2,588	12.06
8. Severe auditory impairment	1,592 ^d	1,867	8.70

Table 9: Estimated Distribution of Risk Population by Major Groups
(Continued)

9.	Severe visual impairment	475 ^e	482	2.25
10.	Obvious confusion and disorientation	20,000 ^f	20,000	93.19

SOURCES: ^aSee U.S. Summary: General Population Characteristics, Vol. 1, Pt. 1, Tables 50, 52 and 53, U.S. Census, Washington, D.C., 1970.²⁷

^bSee Vital and Health Statistics, DHEW Washington, D.C., Series 10, No. 78, 1969.²⁸

^cSee DHEW, Series 10, No. 87, 1971.²⁹

^dSee DHEW, Series 10, No. 35, 1964.³⁰

^eSee DHEW, Series 10, No. 46, 1963-1964;³¹ Hatfield, E.M., "Estimates of Blindness in the United States," The Sight-Saving Review, Vol. 43, #2, 1973, pp. 69-80.³²
Also see unpublished report of the National Society for the Prevention of Blindness, Inc., January, 1975.³³

^fPartial Reference list includes:

1. Mudford, H.A., Drinking and Deviant Drinking, U.S.A., 1963, Quarterly Journal of Studies on Alcohol, V. 25, 1964.³⁴
2. Eddy Nathan, H. Halbach, I.H. Isbel and M.H. Seevers, "Drug Dependence: Its Significance and Characteristics", Bulletin WHO, Vol. 32, 1965.³⁵
3. Martindale, D., and E. Martindale, The Social Dimension of Mental Illness, Alcoholism and Drug Dependence. Glenwood Publishing Company, 1973.³⁶
4. Also see Section f under Joint Distributions of this report, and Appendix I of this report.

Adjustments for Multiple Handicaps

It has been noted before that the estimates shown in Table 9 are not additive because a person suffering from more than one disabling condition will be counted more than once. Unfortunately, tables showing the distribution of population with one, two, etc., disabling conditions are not available and therefore a reasonable estimate of the numbers of the disabled population cannot be made. From the description of the disabling conditions, however, it seems appropriate to introduce the assumption of independence for categories 4 through 9, so that the proportion of the population with a condition, say A, is independent of whether the person has or has not another condition, B. Accordingly, if the proportion in the population that has A is denoted by a, and the proportion that has only A is denoted by (a), and with similar definitions for b and (b), ab and (ab), etc., one can write the following equations:

$$\begin{aligned}(a) &= a(1-b)(1-c)\dots \\(b) &= (1-a)(1-c)\dots\end{aligned}$$

The estimates of a, b,...etc., for 1975 can be obtained from Table 9 (Col. 4) by moving the decimal point three places to the left. Writing:

$$K = (1-a)(1-b)\dots \quad (2)$$

(1) can be rewritten as

$$\begin{aligned}(a) &= K \frac{a}{1-a} \\(b) &= K \frac{a}{1-b}\end{aligned} \quad (3)$$

and

$$(ab) = K \frac{a}{(1-a)(1-b)} \quad (4)$$

For values of a, b,...given in Table 9 (Col. 4), $K = .94181$, from which values of (a), (b), (ab),...can be obtained from (3) and (4). For example, to find the number per thousand population who had the only disabling condition affecting their upper extremities, we multiply the number per thousand population having that as at least one of their disabling conditions, namely 12.06 (so that: (a) = .01206, see Table 9) with exactly two (2) disabling conditions, say, problems with upper extremities as well as auditory impairments, for which (b) = .00870, we multiply 11.53 by .870/ (1 - .00870) to get .10, etc.

Disability Rates by Mutually Exclusive Categories

It may be noted that in the given example, values of a, b,... are small, so that the proportions of the population with three or more conditions are virtually negligible.

Consequently, without significant loss of accuracy, the joint distribution of disabilities can be formulated in terms of a two-way table (Table 10) in which the diagonal elements represent the proportion of the population affected by only one condition and the others by two conditions described by the appropriate row and the column. These latter proportions are derived from (4) and the diagonal elements are obtained so that the sum of a given row or column corresponds to the given values of a, b,... in Table 9, Col. 4. This way, proportions with three or more conditions will be merged with those with only one condition and hence the relative error will be eliminated.

Table 10: Number Per 1000 Population Corresponding to One and Two Disabling Conditions*

Conditions (Col.1)	Wheel- chair (Col.2)	Walking with Aids (Col.3)	Walking with Difficulty (Col.4)	Upper Extrem- ities and Shoulders (Col.5)	Auditory Impair- ment (Col.6)	Visual Impair- ment (Col.7)
Wheelchair	2.03 (434)	.00	.00	.02	.02	.00
Walking with Aids	.00	22.99 (4933)	.00	.26	.19	.05
Walking with Difficulty	.00	(.00)	10.69 (2294)	.12	.09	.02
Upper Extrem- ities and Shoulders	.02 (4)	.26 (56)	.12 (26)	11.53 (2475)	.10	.02
Auditory Impairment	.02 (4)	.19 (41)	.09 (19)	.10 (21)	8.29 (1779)	.02
Visual Impairment	.00 (1)	.05 (11)	.02 (4)	.02 (4)	.02 (4)	2.13 (457)
Total	2.07	23.48	10.92	12.05	8.71	2.24
*Estimated number (in 000) are for the year 1975 and are shown in parentheses.						

For reasons of simplicity, all six categories (4-9) were treated in the same manner. However, from a common sense point of view, categories 4-9 can be regarded as mutually exclusive. Accordingly, the proportions corresponding to any pair of these categories were merged with the respective diagonal element in Table 10.

The sum of the diagonal elements (reading from top left to bottom right) is 12,372, and this provides an estimate of the population suffering from only one disabling condition which for the year 1975 is about 12.4 million. The elements beneath the diagonal of the matrix add up to 195 (000's) or about one-fifth of one million, which, on the one hand, is the estimated size of the population suffering from more than one disabling condition, and is the amount of error due to double counting in the total of Col. 3 of Table 9, on the other. The sum of these two numbers, or 12.5 million (which is the sum total of mutually exclusive categories of disabling conditions) can therefore be regarded as an estimate of the size of the disabled population in the United States in 1975.

The same principle of decomposition can be used on any subgroup of population (e.g., sex, age, race, place of residence, etc.). Unfortunately, rates are not available for all disabling conditions broken down into a uniform set of age categories. However, a rough estimate of the decomposition of the 12.5 million disabled population can be obtained by noting that among those in the 18-64 age category, numbers per 1000 population using wheelchair, and those with severe auditory and visual problems are approximately 20, 6.3 and 1, respectively (derived from Tables 11-15). In round numbers, the disabled population in the age category 18-64 can be estimated at 3 million. The balance of 9.5 million suffering from one or more disabling conditions are either young or old, and as such, comprise a significant proportion of the 89.5 million in those age categories. The difference between these two numbers, namely 80 million, represents that portion of the young and old population that are not disabled, but by virtue of their age, represent a different kind of risk population.

Joint Distributions

The discussion in the previous section has dealt specifically with categories 4 through 9, and estimates are derived separately for each disability, and jointly for a pair of disabilities. Categories 1 through 3 refer to selected age groups that are not mutually exclusive for the remaining groups. In many cases, it will be of interest to obtain disability rates specific for age, and other variables like sex, race, region, urban-rural residence, socioeconomic status groups, etc. The list of such cross-classifications can be made virtually endless; however, in a given instant of time, such inquiries have to be limited by the data that are available. The following summary is therefore provided for the benefit of readers who are interested in finding out the breadth as well as the depth of the volumes of data that are available in this area and data that have been tabulated, analyzed and published.

- a. Age (Categories 1-3). The distribution of population by age is available by single years of age (which can then be conveniently grouped) cross-classified further by sex, race, geographic region, state and many other variables. Distributions for these categories are available for the year 1970 in the Census reports. Intercensal estimates or short-term projections can also be made at the national level with

considerable reliability. However, regional estimates, say for the year 1975, and similar other estimates, have to depend on intergroup population movements, and additional assumptions are required to measure those variables. Ordinarily, such assumptions are required to measure those variables. Ordinarily, such assumptions are made in relation to their distributions in census years. To give an example, consider the Census Bureau's projection of the U.S. population for the years 1975, 1980, etc., with four different assumptions of the trend of fertility. One can average those trends or use any of the four projections, but additional assumptions are required when one has to distribute these national projected estimates by, say, place of residence. Thus, Table 11 can be obtained by assuming average fertility as well as constancy of urban to total population in all age-sex groups for the period 1970-75. In this example, the latter assumption may be justified since its application is not extended beyond a short period of time. However, operational simplicity should not be the principal determinant where a different approach is indicated by a prior information.

Table 11: Projected Age-Sex Composition of Population by Place of Residence: U.S. 1975

Age (Col.1)	Population (000)					
	Urban		Non-Urban		Total	
	(Col.2) M	(Col.3) F	(Col.4) M	(Col.5) F	(Col.6) M	(Col.7) F
Under 6	7,759	7,445	2,932	2,790	10,691	10,235
6-17	16,733	16,288	6,934	6,527	23,667	22,815
18-24	10,941	10,779	3,126	2,935	14,067	13,714
25-44	19,664	20,267	6,956	6,947	26,620	27,214
45-64	14,955	17,010	5,665	5,801	20,620	22,811
65 and over	6,324	9,867	2,746	3,233	9,070	13,100
TOTAL	76,376	81,656	28,359	28,233	104,735	109,889
Source: U.S. Bureau of Census; Current Population Reports Series P25, Nos. 311, 483 and 493.						

In a similar fashion, population estimates for other classification categories can be derived. For example, an estimate of the number of urban males 65 years of age or older with severe visual impairment can be obtained by multiplying the estimated population size by the corresponding rate. Since any cross-classifica-

tion like that shown in Table 11 has to be obtained from similar tables for the year 1970 with appropriate assumptions, a few summary tables from the 1970 Census reports are represented in Appendix D.

- b. Users of Special Aids (Categories 4-9). According to a household survey (a national sample of about 42,000 households covering 134,000 persons) conducted by the DHEW in 1969, more than six million persons were estimated to be using special aids for getting around. This accounted for over 3 percent of the total population. The distribution by selected age-sex categories is shown in Table 12.

Table 12: Age-Sex Specific Rates of People using Special Aids*
(Expressed as Percentages of the whole population)

Sex	Under 15	15-44	45-64	65 and over	All Ages
(Col.1)	(Col.2)	(Col.3)	(Col.4)	(Col.5)	(Col.6)
Male	2.6	1.5	3.6	12.4	3.4
Female	1.8	0.7	2.9	13.4	3.0
*Artificial arm, artificial leg, brace of any kind, crutches, cane or walking stick, special shoes, wheelchair, walker, or any kind of aid for getting around were the nine items used in the list.					

Persons 15-44 years of age reportedly had the lowest percentage of the population using aids and persons 65 years and over reportedly had the highest. It may be noted that the percentage of use of aids for the latter group was about four times greater than that of the next lower age group, namely 45-64 years. A few important cross-classifications for the users of special aids are shown in Appendix E.

- c. Impairment of Upper Extremities and Shoulders (Category 7). Impairment, as defined by DHEW, is "a chronic or permanent defect, disabling or not, representing for the most part decrease or loss of ability to perform certain functions, particularly those of the musculoskeletal system and special senses."²⁹ Data on various kinds of impairment were obtained during 1971 from a random sample of about 42,000 households containing some 134,000 persons. Impairment of upper extremities and shoulders was found to have a prevalence of approximately 12.1 per 1,000 population. This category was isolated because of the visibility, in most cases, of such an impairment, whereas the users of special aids are visible primarily because of the aids they use, and only secondarily by

their disabling conditions. Since DHEW is more interested in impairments in general, and causes of impairments in particular, distributions of population with this condition are available only for a limited number of characteristics (see Appendix F), where injury of some kind was the cause of such condition.

- d. Severe Auditory Impairment (Category 8). Information about persons with impaired hearing was obtained from a supplementary questionnaire mailed to those persons for whom hearing impairment was reported during an interview conducted by the Bureau of the Census in 1962-63 for the Health Interview Survey. As with other similar surveys, the data were collected from a continuous probability sampling of the civilian, noninstitutional population of the United States. This particular sample consisted of some 42,000 households containing about 134,000 persons. For the purpose of the report, severity of hearing impairment is of interest when it excludes persons with hearing impairment in only one ear. Among persons with hearing impairment in both ears (binaural), the DHEW report makes the following distinction among persons who: 1) cannot hear and understand spoken words; 2) can hear and understand a few spoken words; and 3) can hear and understand most spoken words.

Even though the distinction between the last two subgroups is based on some arbitrary dividing line, it was decided to combine the first two subgroups to generate the category of "severe auditory impairments." During the reference period (1962-63), 1.6 million persons were found in this category, and Table 13 records the distribution and rate per 1,000 population by sex and broad age categories.

Table 13: Distribution of Persons with Severe Auditory Impairment by Sex and Age and of Rates Per 1,000 Population

Age	Number of Persons With Impairment			Rates per 1000 Persons With Impairment		
	Male	Female	Total	Male	Female	Total
(Col.1)	(Col.2)	(Col.3)	(Col.4)	(Col.5)	(Col.6)	(Col.7)
Under 17 years	46	42	88	1.3	1.4	1.4
17-44	105	112	217	3.5	3.4	3.4
45-64	243	185	428	13.5	9.7	11.5
65 and over	403	456	858	53.7	48.7	50.9
All ages	827	794	1,592	9.0	8.4	8.7

Distributions are also available by family income, number of years completed in school, race, and residence, and also for the four regions of the country, each classified by age. These tables are shown in Appendix G.

e. Severe Visual Impairment (Category 9).

Information about visually impaired persons was also collected by DHEW during a 52-week period and the sample was so designed that interviews were conducted every week during the period for this survey (July 1963 to June 1964).³¹ This sample was also composed of approximately 42,000 households consisting of about 134,000 persons. In identifying vision problems, no attempt was made in the survey to equate blindness in the legal sense, because a visual acuity test is basic to the legal definition of blindness:³² "A person shall be considered blind whose central visual acuity does not exceed 20/200, has a limit to the field of vision to such a degree that its widest diameter subtends an angle of not greater than 20 degrees."

A detailed classification of visually impaired persons (6 years and over) was, however, developed using data obtained from the questionnaire designed for this survey. These were: (a) both eyes involved; (b) one eye involved; and (c) unknown if one or both eyes involved. The first group was of primary interest and was further subdivided into two categories--persons who cannot read newsprint and persons who can read newsprint. Further subdivisions were also made to elicit as much information as possible (e.g., can or cannot see features, moving objects, and light). A summary of the estimates of visually impaired population in a number of subgroups is shown in Table 14. For practical reasons children under six years of age were excluded.

Females reported an overall higher rate of vision impairment than did males. The reasons for this significant difference are not known. However, increase in rates of impairment with age is in the expected direction. Additional cross-classifications with respect to income, education, region, race and place of residence (urban, rural nonfarm and rural farm) are shown in Appendix H. Persons in lower income brackets with less than 9 years of education reported considerably higher rates of vision impairment. Rates for nonwhites, as well as for southerners, were found to be higher; the lowest rates were found among persons living in standard metropolitan statistical areas.

Summarizing the results, almost one million persons, 6 years of age and over, during the reference period 1963-64, were found to have impairments in both eyes to the extent that they could not read newsprint. However, this provides an upper boundary of the estimated number of persons with severe visual impairments since more than two-thirds of these people could see features and moving objects. On the other hand, there were a few who could read newsprint but could not see features. From the point of view of pedestrian-related problems, one may argue that the relevant subgroup should consist of those who cannot see features or moving objects.

The size of this category was approximately 300,000, and assuming that the increase in size during the following year was proportional to that in the general population, the estimate for the year 1975 will be approximately 375,000. This estimate should be regarded as the lower boundary of the group that is characterized by severe visual impairment and, on comparing with the 1974 estimate (furnished by the National Society for the Prevention of Blindness) of 475,000 people who are legally blind, it was felt that the latter estimate is reasonable (see Appendix H, Table 38).

Table 14: Number of Visually Impaired Persons (1000) with Both Eyes Involved by Degree of Impairment, Sex and Age
U.S. July 1963 - 1964

Degree of Impairment (Col.1)	Male (Col.2)	Female (Col.3)	All (Col.4)	6-44 (Col.5)	45-64 (Col.6)	65+ Years (Col.7)
Cannot see Features and/or Moving Objects	121	189	310	33	57	221
Cannot read Newsprint	108	179	287	30	50	207
Can read Newsprint	13	10	23	3	7	14
Can see Features and Moving Objects	878	1,468	2,346	408	657	1,280
Cannot read Newsprint	240	442	682	67	142	472
Can read Newsprint	638	1,062	1,664	341	515	808

f. Obvious Confusion and/or Disorientation (Category 10).

Data for this category are most difficult to find since the basic characteristics of the population with these conditions cannot be adequately defined. For this study, it was decided to use three groups of people: those who are a) alcoholics; b) dependent on drugs; and c) mentally ill (see Appendix I).

Although various researchers have studied these three problem areas, reliable estimates of the population corresponding to these conditions are not available. In round numbers, a figure of 20 million has been accepted and shown in Table 9, without any attempt at further decomposition.

Discussion of Results

For the ten categories of the disabled population, projected estimates for the year 1975 (Table 9) provided the basic input which was later decomposed into mutually exclusive categories that provided some insight into the procedure for estimating the size of the disabled population. Fortunately, when the assumption of independence held, the amount of double counting was found to be small (around two percent), because the incidence rates of the various disabling conditions were also small in magnitude. As a result, it was found virtually unnecessary to make adjustments for cases involving more than two disabling conditions.

The detailed distributions available for each condition were later examined in terms of their variety, uniformity and usefulness. The users of this particular study may be frustrated by lack of data; however, in most cases the basic data that are available in the source materials can be used to generate required distributions with appropriate assumptions, at least in certain cases. As an illustration, the distribution of population by sex can be generated from Col. 3, Table 9, by applying the proportions noted for each sex in the base years. Table 15 can then be obtained.

Table 15: Estimate of Disabled Population (000) by Sex
United States, 1975

Disability Type	Percent	Estimated Disabled Population		
(Col. 1)	Male (Col. 2)	Male (Col. 3)	Female (Col. 4)	Total (Col. 5)
Confined to wheelchair	43.8	195	250	445
Walking with special aids	50.0	2,519	2,523	5,042
Walking with difficulty	47.5	1,114	1,230	2,344
Chronic impairment of upper extremities and shoulders	68.6	1,777	811	2,588
Severe auditory impairment	51.0	953	914	1,867
Severe visual impairment	35.9	173	309	482

This distribution may further be decomposed with respect to other variables. For example, 19.5 per thousand population (see Appendix F Table 36) of males 65 years and over suffer from impairments of upper extremities and shoulders. Assuming stability of this rate of incidence, an estimate for the year 1975 can be obtained by multiplying this rate by the projected male population of 9,070 (see Table 11) in the age group 65 and above—about 176,000 people. Estimates for other categories of disabilities and population types can be similarly obtained when basic data are available.

environmental problems for elderly and handicapped pedestrians

Background

Many handicapped people are greatly inconvenienced or actually prevented from using the built environment because of barriers to movement that have been constructed. The nature of these barriers within buildings has been quite extensively researched. But barriers in the exterior urban environment, on the other hand, are not so well understood, and have received comparatively little attention.

As a result, there is an extending stock of accessible buildings, but nowhere is there an accessible town, nor even an accessible district; in fact, there are very few streets that are fully accessible, so the routes from accessible building to accessible building may well be unusable, or usable with great difficulty.

The difficulties that face the elderly, as they travel around the town, are even less well understood, because the elderly are not thought of as handicapped. While not all of the elderly experience handicapping difficulties, nevertheless most do, for the normal degenerative processes of advancing age engender physiological and perceptual changes that diminish the ability of people to perceive, recognize, and negotiate environmental hazards and barriers.

The purpose of the research described in this study (and the companion volumes) is to suggest 'Provisions for Elderly and Handicapped Pedestrians'. Some compilation and understanding of the problems is necessary before solutions can be recommended.

The question is what are these problems (and hazards) facing the elderly and handicapped pedestrian? The literature doesn't help us much. It tends to be voluminous and repetitious; there are, for instance, several manuals that deal with exterior accessibility largely in terms of site planning solutions. But most of the published

material, and even the standards and codes, have started with the assumption that the problems are known. None of the published studies have been directed at identifying and classifying the problems in a reasonably comprehensive manner.

Part 1 of this volume, "Accidents: Causes and Countermeasures" treats the question of hazards. Problems are addressed in the study that follows which describes field studies conducted in five cities that were directed at generating a typology and a listing of mobility problems.

Scope of the Study

The scope of the study was limited to 'street related' provisions for elderly and handicapped pedestrians. Coincidentally, a study at Syracuse University for the Department of Housing and Urban Development was started at the same time and programmed to last approximately the same period. That study was directed at preparing extensive revisions to the American National Standards Institute, "Specifications for making buildings and facilities accessible to and usable by physically handicapped people."³⁹ The specifications deal with both the interior and the exterior environment.

Because the Housing and Urban Development study and this study for the Federal Highway Administration were to be carried out more or less simultaneously, it was informally agreed that the research at Syracuse University would concentrate principally, but not exclusively, on the interior environment, and that the team at Georgia Institute of Technology would focus on the exterior urban environment with the exception of transportation accessibility which was being addressed by the Urban Mass Transit Administration of the Department of Transportation.

These mutually agreed upon scope limitations inevitably left some areas of overlap. Mass transit, for example, cannot be effective if passengers cannot enter and use terminals and transit stops. And buildings cannot be used by all if the associated parking areas and entrances are not usable. So, as will be apparent from the survey topics that are discussed later, the scope has been somewhat widened from being simply 'street related'. Nevertheless, the project is primarily limited to urban settings rather than rural, and access routes rather than parks, recreational areas, and buildings.

The Field Studies

Not only is there a very large number of disabilities that handicap people, but also many of these disabilities vary in degree. Visual impairment, for example, ranges from near sightedness that may prevent people from reading pedestrian signs, to total blindness where even the ability to perceive light is absent. Between these extremes lies the whole range of visual disabilities, each of which affect, in different ways, the person's ability to perceive the pedestrian environment.

Furthermore, the environment itself is neither constant nor uniform. People with disabilities who live in warm climates will have different difficulties to those in cold climates. And those who live in towns that have essentially level terrain will have to

react differently to those in hilly towns. And the environment in poor areas presents somewhat different problems to those in wealthier areas.

For these reasons, and because of the absence of published field studies, it was decided to collect data from a representative sample of elderly and handicapped people, and from mobility instructors and others who work with them; and to collect the data in five cities in the United States that differ substantially in terms of climate, topography, socio-economic characteristics and regional location. The cities selected were Atlanta, Tampa/St. Petersburg, Chicago, San Francisco, and Seattle.

Methods Used

Three very different but complementary techniques were used for gathering the data in the field.

- focussed but unstructured interviews with individuals,
- panel discussions with groups of people who were elderly and handicapped or who work with them, and
- field observations using mobility tracking. In this method, the observers followed individual elderly and handicapped people as they moved around urban areas, and then recorded their responses to the environment and to known mobility barriers.

The focussed interviews were used to obtain information based on the personal mobility experiences of elderly and handicapped individuals, and from the experiences of mobility instructors and others who work with the problems on a day-to-day basis. The panel discussions were used to generate discussion through the interaction of the participants, and by this means, to expand the exploration of the topics. The tracking studies were used to observe how elderly and handicapped people actually responded to the problems of the existing urban environment. A detailed description of each of these methodical devices follows.

The Focussed Interviews

For the focussed interviews in the five cities, the interview subjects were identified for the project team by more than eighty local social and health service agencies, community associations, and organizations representing elderly and other disability groups.

All of the organizations that arranged for the interviews were asked not to select subjects, but rather to explain the nature of the study to people, and then enable them to volunteer.

In order to improve the representativeness of the sample surveyed, special efforts were made by the participating agencies to identify people who do not usually have much contact with community-service organizations—either because they are well assimilated into society and need little community assistance, or because they are neither integrated into society nor in contact with community service groups.

A tabulation of the various categories of people interviewed in the five cities is shown in Table 20; and Tables 21 to 25 in Appendix C list the categories of people interviewed in each of the five cities separately. A total of 338 people were interviewed—194 males and 144 females. Ninety-two people were interviewed in Tampa/St. Petersburg; 73 in Chicago; 67 in San Francisco; 65 in Seattle; and 41 in Atlanta.

During the interviews, personal information was elicited from the subjects and recorded in a standardized form. The remainder of each interview was used for discussing the subject's mobility problems. The interviewer did not attempt to control the conversation except to introduce, from time to time, new topics drawn from a check list. These topics were largely derived from the literature and were formulated into a list, in advance of the survey (and the check list was pre-tested on subjects in Atlanta). However, additions were made to the check list as further topical issues were revealed, and as the Five-City Survey proceeded.

The interviews focussed on:

- trip information,
- stamina,
- the effects of weather,
- steps, stairs, ramps, elevators,
- walkway surfaces,
- pedestrian behavior,
- street furniture,
- street illumination,
- street crime,
- signs,
- crossing streets,
- street and sidewalk layout and geometry,
- the law governing pedestrians,
- transportation,
- environmental barriers.

During the interview, the interviewer made written notes of the subject's responses. With the permission of the subjects, the interviews were also tape recorded and these

recordings were used to elucidate and elaborate on the written notes. The product of all these interviews and the panel discussions have been compiled into problem statements, and these are presented later.

The Panel Discussions

Seventeen panel discussions were held; three in San Francisco; three in Tampa/St. Petersburg; three in Atlanta; two in Chicago and six in Seattle. Some of the panels consisted of people with various disabilities, and some were composed of people with a specific disability—impaired hearing, for example. Most of the panels included both people who are handicapped, and people who train, treat, or work with handicapped people.

The panel discussions had the same format as the interviews, focussing on a list of topics. However, the composition of the panel membership enabled the team to discuss a large number of issues in a comparatively short time. And the interaction between the panel members stimulated discussion in some depth on the problems as perceived by the group.

The panels were also productive in bringing forward problems that cause inconvenience rather than inaccessibility. Handicapped and elderly people (and also able bodied people) have to make many adjustments to the routes that they choose, to allow for environmental hazards and barriers. For most able bodied people, a car parked across a sidewalk, for example, is an irritating inconvenience which perhaps mandates leaving the sidewalk and going into the street in order to walk around the car. For someone in a wheelchair, the adjustment may have to be much more extensive, involving crossing the road by means of curb ramps and recrossing the road at some place where there are more curb ramps.

The panel discussions were also useful in revealing some factors that an individual might fail to mention in an interview because the problem is not thought of as being a problem; individuals might forget to mention difficulties and hazards which they accept as a normal part of using the environment. For example, a visually impaired person might fail to mention the hazards of walking into a low overhanging street sign, simply because low street signs are a common occurrence.

The comments made at the panel discussions were recorded on tape, with the permission of the participants, and later translated into the problem statements that are presented later in this report.

Mobility Tracking Studies

The interviews and panel discussions provided a long list of problems experienced by the elderly and handicapped pedestrians. But from the outset of the study, it was decided that some observations of the target group actually using the urban environment would be necessary for several reasons. Firstly, it seemed extremely probable that observations would reveal many examples of coping and problem avoidance behavior that might not surface in discussion. Secondly, the observations would record actual

behavior rather than described behavior, and would therefore serve to verify and elucidate some of the stated problems. Thirdly, the observations would be unobtrusive, and therefore, would not affect the responses of the subjects in the way that interviews and panel discussions might; the observed subjects would respond to the environment in their usual way, while in discussion the subjects, for example, might feel a duty to discuss what they understood to be the problems of other handicapped people, rather than their own problems (and in practice, this was found to be the case quite often).

In each of the five cities, locations for tracking studies were selected largely on the basis of their probable frequency of use by elderly and handicapped people; for example, streets adjoining housing for the elderly, rehabilitation units, health facilities, sheltered work shops, downtown shopping and business areas, recreation areas, etc.

The subjects were selected for observation solely based on their characteristics matching the target groups discussed earlier. After identifying a subject, the observer would unobtrusively follow at a discrete distance, noting the way the subject used the environment, and particularly, the ways in which the behavior differed from the rest of the population.

For example, tracking report #194 is of an elderly white male, 65-70 years old, who uses a cane. From the tracking notes we find that his movement is 'very unstable and very slow', 'had a problem in crossing the street within the time allotted by the traffic light', 'at the curb he used a lamp post to stabilize himself while stepping down into the street'.

In about ten percent of the observations, the observer would catch up with the subject and discuss the reasons for the behavior--after identifying himself and briefly describing the project. The purpose of these short interviews was to elucidate puzzling behaviors, and to confirm or refute the observers conclusions.

The observer recorded his notes on a form which included space for standardized information on the location, weather, time; and the age, sex, race and handicap of the subject. After completing the observations for a subject, usually within five to ten minutes, the observer would select the next elderly or handicapped person who came into view, and start the process again. The observer did not follow subjects into buildings or on to transportation, nor for a distance greater than about three city blocks.

A total of 619 tracking observations were made: 109 in Tampa/St. Petersburg; 136 in Chicago; 154 in San Francisco; 160 in Seattle; and 60 in Atlanta. Tables 40 to 45 in Appendix J list the categories of people observed in total and for each of the five cities separately. And the conclusions from the tracking study have been included in the list of problem statements that follow.

The Problem Statements

The problem statements that follow are the cumulative result of the focussed interviews, the panel discussions and the tracking study. The material has, of course,

been categorized, and the wording of the problems as stated has been edited for clarity. Some of the statements differ from each other only slightly, but these differences are considered to be significant enough to warrant retention. For example:

- I cannot descend ramps.
- I cannot descend steep ramps.

The statements do not represent any sort of consensus. In fact, a problem may have been articulated by only one of the people interviewed. A discussion on the general importance of problems is taken up later.

trip information

1. I WOULD GO OUT OR MAKE MORE TRIPS:

- If public transportation was made accessible.
- If there was more public transportation.
- If there was cheaper transportation.
- If environmental barriers were removed.
- If walkways were repaired and maintained.
- If walkways were easier to travel over.
- If walkways were kept clear of snow and ice.
- If I didn't have to travel so far to shops, etc.
- If I had a suitable vehicle.
- If I had an electric wheelchair.
- If I had a more dependable wheelchair.
- If someone would assist me during trip.
- If there were more accessible parking places I could use.
- If the crime problem was eliminated.
- But I am afraid of crime at night.
- But I am afraid of being mugged if I stopped to rest.

- If benches were placed where I would not be mugged.
- If I had mobility training in how to get around.
- But I need a guidebook to accessible facilities.
- If public recreation areas were more accessible.
- If there were more places for me to rest.

2. I PLAN MY ROUTE IN ADVANCE:

- To keep it as short as possible.
- To conserve my energy.
- To avoid hazardous situations.
- To avoid obstacles.
- To avoid busy pedestrian walkways.
- To avoid heavily trafficked streets.
- To avoid traffic lights that change quickly and don't give me enough time to cross the road.
- To avoid getting lost.
- To avoid high crime areas.

3. GENERAL TRIP STATEMENTS:

- In many places there are no sidewalks or walkways provided and I cannot travel in the road.
- Public interferes with my guide dog.
- Public is ignorant of guide dog laws.
- Public is often unwilling to help me when I am in difficulty.
- Public often tries to help me when I do not require it.
- Public doesn't believe a person is deaf if he can speak.
- Public sometimes thinks that a handicapped person is begging.
- Some handicapped people are mistaken for drunks.

- Some people think that the handicapped are also mentally retarded.
- Drivers can't recognize that I am disabled.
- Pedestrians don't recognize that I am disabled.
- Poorly made or improperly made prosthesis increases my mobility problems.
- Some voting stations are not accessible, and I cannot vote without assistance.
- There are too few pedestrian walkways.

hills, ramps, stairs, handrails, guardrails

1. HILLS:

- Hills are difficult for me to negotiate.
- Hills are difficult for me to negotiate when wet.
- I cannot descend hills.
- I cannot descend steep hills.
- Descending hills is difficult for me.
- I cannot ascend hills.
- I cannot ascend steep hills.
- Ascending hills is difficult for me.
- I cannot negotiate hills.
- I have balance problems on hills.
- I need handrails on hills.

2. RAMPS:

- Sidewalks with a noticeable cross slope make movement very difficult for me.
- Sidewalks with a noticeable cross slope induce many severely visually handicapped people to veer sideways.
- I cannot descend steep ramps.
- I cannot descend ramps.

- Ramps are difficult for me.
- I am afraid of slipping on ramps.
- I cannot negotiate ramps.
- I cannot ascend long ramps.
- I prefer steps to ramps for descent.
- I prefer steps to ramps for ascent.
- I prefer ramps to steps for descent.
- I prefer ramps to steps for ascent.
- Some ramps with an abrupt transition to the connecting walkways cause my footrest to hit the ground.
- Ramps without handrails are difficult for me to negotiate.
- I need handrails on ramps.
- Ramps are often too narrow for me.
- I am afraid of losing my balance on ramps.

3. STEPS, STAIRS, FIRE ESCAPES:

- I cannot manage any step without help.
- I can only manage 1 or 2 steps without help.
- I can manage stairs with difficulty.
- I have difficulty descending stairs.
- I have difficulty ascending stairs.
- High risers are very difficult for me.
- Mobile home steps are often too high for me without help.
- Small steps (up to 2" high) are difficult for me.
- Small steps (up to 2" high) are impossible for me without help.
- A step at the bottom of a ramp that is as little as 1" may cause my chair to overturn if I 'take a run' at it.

handrails and guardrails

1. HANDRAILS:

- I always use handrails ascending stairs.
- I always use handrails descending stairs.
- I need handrails for ascent and descent on stairs.
- I need handrails for descent on ramps.
- I need handrails for ascent on ramps.
- Handrails are often inadequate for me to grasp comfortably.
- Handrails often don't feel secure to me.
- Handrails are often too high.
- Handrails are often too low.
- Handrails are sometimes on the wrong side, and unless there is a center handrail, two-way traffic makes it difficult for me to use the one I need.
- Handrails don't extend far enough past top and bottom of stair for me to use them.
- Handrails are often not continuous.
- Handrails are often too slippery to hold.
- Handrails of metal become too hot in summer or too cold in winter for outdoor use.

2. GUARDRAILS:

- There is often no guardrail protecting grade changes.
- People with limited vision may trip or fall at street repair sites which don't have adequate protective barriers.
- Some types of protective barriers and particularly those with chains are hazardous because people with low vision and those visually impaired people who use canes may fail to detect them.

stamina

1. WHEN WALKING OR WHEELING UNDER IDEAL CONDITIONS, I MUST STOP AND REST:
 - After traveling for less than one (1) minute.
 - After traveling between one (1) and five (5) minutes.
 - After traveling five (5) to ten (10) minutes.
2. WHEN TIRED, I HAVE TO REST APPROXIMATELY:
 - Less than two (2) minutes.
 - Two (2) to five (5) minutes.
 - More than five (5) minutes, but less than fifteen (15).
 - Fifteen (15) minutes or more.
3. WHEN TIRED, I HAVE TO:
 - Rest where the benches are.
 - Often find curbs or steps to sit on.
 - Go to a cafe to rest.
 - Return to the car to rest.
 - Frequently rest against a pole or wall.
 - Stand and rest.
 - Rest wherever it is possible.
 - Find a place to get warm (or cool).
4. RESTING PLACES:
 - There are too few seats on which I can rest.
 - There is usually no place for me to sit under cover when it is raining.
 - Need weather protection for benches.
 - Need benches at bus stops.

- Benches are usually too low for me.
- Benches are usually too high for me.
- There are often no arm rests to help me get up from, or down to, benches.
- Benches are often uncomfortable for me to sit on.
- Benches often don't dry quickly enough after rain.
- There are too few resting places for me.
- There are too few resting places out of the traffic stream for wheelchairs.

weather

1. RAIN:

- Damp conditions decrease my agility.
- I am afraid of slipping on wet sidewalks.
- It is difficult for me to hear traffic sounds in rain.
- My wheelchair brakes work poorly in wet weather.
- My wheels (and hands) get muddy in wet weather.
- The drive on my electric wheelchair tends to slip in wet weather.

2. WIND:

- When I travel against a wind it is very tiring.
- I have difficulty in maintaining my balance in wind.
- Wind decreases my ability to hear traffic.
- Wind blows my wheelchair off course.
- Wind-blown dust affects my vision.
- I cannot wipe dust from my eyes.

3. SNOW AND ICE:

- I can never go out in snow and ice.
- Snow reduces sound cues.

- Snow and ice cover location cues.
- Snow and ice are frequently not cleared from the sidewalk.
- Crossings are frequently not cleared of snow and ice.
- Snow is not cleared from minor streets.
- Snow plows often dump snow on sidewalks.
- I cannot climb over snow pushed into the gutter when I wish to catch the bus.

4. COLD CONDITIONS:

- Cold conditions decrease my agility.

5. HOT CONDITIONS:

- Hot conditions decrease my agility.
- High humidity decreases my agility.

surfaces

INTERIOR SURFACES—GENERAL

1. WHEN WALKING/WHEELING AROUND, I OFTEN FIND THAT:

- Wood flooring is often too slippery.
- Terrazo flooring is often too slippery.
- Plastic tile floors are often too slippery.
- Polished marble is often too slippery.
- Wet, smooth surfaces are usually too slippery.
- Entrances to buildings are often wet and slippery.
- Throw rugs are likely to slide.
- Thick carpeting or padded carpeting is difficult to move across.

EXTERIOR SURFACES--GENERAL

1. WHEN WALKING/WHEELING AROUND, I OFTEN FIND THAT:

- Where sidewalks pass filling stations and parking lots, paved with the same material as the sidewalk, I may wander off the walkway unintentionally because I cannot see.
- Surfaces with many paving joints cause me discomfort because they cause jolting.
- Surfaces which are uneven at the joints are difficult for me to cross.
- I am concerned that paving joints may cause me to trip.
- Some paving joints are slippery when wet or icy.
- Weeds in paving joints may cause me to slip and trip.
- Sand, gravel or loose material is difficult for me to negotiate.
- Sand, gravel or loose material is impossible for me to negotiate.
- Muddy surfaces are impossible for me to negotiate.
- Muddy surfaces are difficult for me to negotiate.
- Brick surfaces are impossible for me to negotiate.
- Brick surfaces are difficult for me to negotiate.
- Uneven and irregular surfaces are impossible for me to negotiate.
- Uneven and irregular surfaces are difficult for me to negotiate.
- Lawns are difficult for me to negotiate.
- Lawns are impossible for me to negotiate.
- I rely on sound cues generated by traffic moving over surfaces.

2. SIDEWALKS:

- Sidewalks and walkways which have a noticeable slope to one side make it difficult for me to travel in a straight line.
- Badly maintained sidewalks often prevent me from using them.
- I must frequently avoid dog excreta on sidewalks.

- I must frequently avoid garbage and litter on sidewalks.
- I cannot see dog excreta, litter, or garbage on sidewalks.
- Cars parked on the sidewalk are a frequent barrier.
- I am afraid of bicycles ridden on pedestrian paths.
- I am frequently forced to travel on roads because of sidewalk barriers.
- Sometimes I move off the sidewalk into the road by mistake, if there are no obvious separations between the sidewalk and the road.
- If there are no sidewalks, it is difficult for me to get around.
- If there are no sidewalks, it is impossible for me to get around.

3. ROADS:

- I have to be careful not to slip on gutters at the side of roads.
- I am frightened of slipping on areas of roads on which oil from vehicles has leaked.
- Large paved areas of service stations and the entrances to parking lots are confusing or make it difficult for visually impaired people to find their way.

4. ACCESS/SERVICE COVERS, ETC.:

- Some types of grating impede my movement.
- Manhole covers will impede my movement.
- Crutches, canes and the wheels of wheelchairs can easily snag in certain types of gratings, and this is hazardous.
- Manholes and other access covers tend to be slippery when wet or icy.

5. REPAIR SITES:

- Repair and building sites not kept clear of debris are a frequent barrier.
- I am afraid of having a fall at street repair sites because they often don't provide warning barriers that I can detect before I walk into them.
- I am afraid of falling into unprotected ditches and holes.
- Sidewalk repair sites are often a barrier for me.

6. TRAIN TRACKS:

- It is impossible for me to cross most train and tram tracks.
- It is difficult for me to cross train and tram tracks.
- Many railroad crossings have warnings which I cannot perceive.

congestion

1. GENERAL:

- I am afraid of moving in crowds.
- I am afraid of being bumped.
- I am afraid of crowded stairs.
- I avoid going out in crowds.
- I am concerned that I may bump into people.
- It is very difficult for me to maneuver in crowds.
- Crowds make me lose my sense of direction.
- Some sidewalks are too narrow for me to travel on without difficulty.
- I will usually stop to allow crowds to disperse before moving along sidewalks.
- For safety, I prefer to move with a group of people rather than on my own.

2. ON WALKWAYS I TEND TO:

- Travel faster than most people.
- Travel slower than most people.
- Travel about the same speed as most other people.

mailboxes, parking meters, lamp posts, etc.

1. GENERAL

- I am afraid of bumping into low overhanging projections--branches, signs, awnings, etc., that I cannot see.
- I am afraid of bumping into drinking fountains, parking meters, etc.

- I am afraid of bumping into, or tripping over, low objects.
- I may not be able to detect all low or suspended objects like guardrails and chains before bumping into them.
- Lamp posts, parking meters, etc., at curb edges and corners, usually obstruct my movement.
- Moveable street furniture (newspaper dispensers, portable signs, etc.) often obstructs my movement.
- I often use lamp posts, mailboxes, etc., to tell me where I am.
- I am concerned that mailboxes, lamp posts, etc., will prevent drivers from seeing me when I am about to cross the road.
- I often use mailboxes, lamp posts, etc., to help me climb onto the curb.
- I often use mailboxes, lamp posts, etc., to help me down the curb.

lighting, signs, perception

1. DAYLIGHT:

- Sunlight reflected off light-colored surfaces makes it difficult for me to see where I am going.
- Bright sunlight and shadows make it difficult for me to see the walkway.
- It is difficult for me to see traffic lights in bright sunlight.

2. NIGHT LIGHTING—ARTIFICIAL:

- I cannot use walkways where the surface is poorly illuminated.
- It is difficult to use walkways where the surface is poorly illuminated.
- Poorly lighted steps and stairs are particularly hazardous for me.
- I am concerned about crime in poorly lighted areas.
- I am afraid that drivers won't see me at night.
- Illuminated advertising signs often make it difficult to see traffic signals.
- I am concerned that drivers will not notice me.
- I am concerned that drivers won't notice the dog that accompanies me.

3. STREET NAMES AND PEDESTRIAN TRAFFIC SIGNS AND SIGNALS:

- I often cannot read street signs and signals because they are too small and too high.
- Because I have limited head movement, I may not see signs that do not face my direction of travel.
- I find that I cannot read street signs at night because they are poorly illuminated.
- Street signs are frequently obscured by other street equipment.
- I am concerned that confusing signs distract the driver from seeing pedestrians.
- I cannot read written signs.
- Information in transit terminals and other places is usually given by visual means or public address systems, but not both. So some people will not receive the messages.
- I cannot understand signs that use symbols instead of words.
- I cannot understand complicated instructions on signs.
- I cannot see signs and signals.
- I have difficulty in seeing road markings, particularly in wet weather.
- I am afraid to cross roads where there are no road markings.
- I am concerned that often vehicular traffic warnings are located too close to the hazard for the driver to have adequate time to react.

traffic lights, crossing roads, curb ramps

1. TRAFFIC LIGHTS:

- In some places it is difficult to know which traffic light I must respond to.
- I sometimes find that traffic lights are placed too high for me to see.
- Parked vehicles sometimes obscure traffic signals.
- Advertising signs and other lights sometimes make it difficult for me to see the traffic light.
- Traffic lights often don't allow me sufficient time to cross the road.
- Pedestrian crossings which are not controlled by lights are difficult for me to use.

- I cannot operate the buttons which control the traffic lights at pedestrian crossings.
- It is difficult for me to operate the buttons which control traffic lights at pedestrian crossings.
- I cannot see the traffic lights.
- I do not understand the traffic lights.
- I do not understand the meaning of the continual flashing 'don't walk' sign.
- I cannot see 'walk/don't walk' signs across the street.
- Right turn on red traffic light makes crossing the street more difficult for me.
- I am concerned that traffic turning on green lights will not give me the right of way.
- Special signals and green arrows that permit traffic to turn make me apprehensive about crossing the road.

2. CROSSING ROADS:

- I cannot cross road surfaces which are in bad condition at crossings.
- I find it difficult to cross road surfaces which are in bad condition at crossings.
- I find it difficult to cross roads that are at all wet, slippery, or oily.
- I have to be careful to avoid manhole covers and gratings in crossings.
- On busy sidewalks there is seldom enough space for people to wait for the 'walk' signal.
- Frequently, parked cars obstruct crossings.
- At crosswalks my view of oncoming traffic is frequently blocked by parked cars.
- Vehicles that stop in the pedestrian crossing make it difficult for me to cross.
- Some roads have too much slope from the center of the road to the gutter and this makes crossing the road much harder for me.
- Overpasses and underpasses are seldom accessible to people in wheelchairs, and other handicapped people.
- I am afraid of slipping on painted road markings.

- Because of poor illumination, I am afraid that drivers will not see me at night.
- I am concerned that I may unknowingly move out of the crosswalk into the traffic stream.
- It is difficult for me to maintain a correct sense of direction when crossing streets that meet at an angle which is not a right angle.
- It is difficult for visually impaired people particularly, to cross streets where there are 4-way stop signs.
- It is frequently difficult for me to cross the road because I cannot locate the crosswalks.
- It is often difficult for me to locate precisely the junction between the crosswalk and the sidewalk.
- I am very apprehensive about crossing very wide, busy streets.
- I am concerned that when I am caught in the crosswalk when the lights change, the motorist's view of me from the middle lanes may be obscured by large vehicles in the outer lane.
- I cannot cross busy streets even at crosswalks.
- I am apprehensive about crossing busy streets even at crosswalks.
- I am concerned that there is insufficient warning to motorists of crosswalks.
- I am concerned that motorists will not see me entering the crosswalk because their view is obscured by trees, poles, planters, parked cars, street furniture, etc.
- I am concerned that, because of my small stature in a wheelchair, drivers will not see me.
- Two-way streets are more difficult to cross than one-way streets.
- It is difficult for me to cross roads if there is traffic movement in any direction during the pedestrian walk cycle.
- It is difficult for me to cross the road if the traffic noises are obscured by loud construction or other noises.
- I am unable to tell when traffic lights change.
- I am concerned when I cross the street that I will not hear the approach of bicycles and other relatively silent vehicles.

- I am concerned that when I use crossings near the brow of hills, oncoming traffic will not see me.
- Where right turns on red are permitted, and where the driver's view to the left is blocked by hedges, trees, buildings, etc., vehicles will edge forward into the crosswalk. This is inconvenient and hazardous.

3. CROSSING BEHAVIOR:

- I avoid crossing the road with the crowd whenever possible.
- I try to cross the road with the crowd whenever possible.
- When I must cross the road and there is no crosswalk, I am concerned that I may misjudge the speed of the traffic.

4. JAYWALKING
I FREQUENTLY JAYWALK:

- To use driveway entrances because there are no curb ramps at the crosswalk.
- Because there are no marked pedestrian crossings.
- To shorten my route.
- Because I am in a hurry.
- To conserve my energy.
- To avoid wind or sun.
- Out of crosswalk to use the curb ramps.
- Because the sidewalk is crowded.
- Because the crosswalk is crowded.

5. TRAFFIC ISLANDS AND HAVENS:

- It is impossible for me to cross wide busy streets.
- It is difficult for me to cross wide busy streets.
- I cannot cross most traffic islands because of the curbs.
- I cannot use most traffic islands because they are too small.
- I am frightened of using small traffic islands in busy streets.

- Many traffic islands are too narrow for wheelchair use.
- I cannot use traffic islands that don't provide something to rest on or lean against.

6. CURBS:

- High curbs are impossible for me to negotiate without help.
- High curbs are difficult for me to negotiate.
- I can't get down curbs without help.
- I can't get up curbs without help.
- I am concerned that I may not see very low curbs and fall.
- All curbs are difficult for me to negotiate.
- I cannot negotiate curbs without something to pull or lean on.
- I cannot negotiate curbs without assistance.
- I am afraid of having an accident caused by a curb edge that is in a broken condition.
- When the edge of the sidewalk is carried around the corner with a large radius, I find it difficult, because I cannot see, to locate myself properly when preparing to cross the road.

7. CURB RAMPS:

- I cannot ascend any curb ramps.
- I cannot descend any curb ramps.
- I cannot ascend curb ramps without handrails.
- I cannot descend curb ramps without handrails.
- The side flares of curb ramps are usually much too steep for my wheelchair to cross without losing my balance.
- Curb ramps are difficult to ascend.
- Curb ramps are difficult to descend.
- Quite often there is not enough level space at the top of a curb ramp for me to slow down my wheelchair and to stop.

- I won't use curb ramps when they are slick or wet.
- Curb ramps often are too narrow for me.
- I cannot manage steep curb ramps.
- I find that steep curb ramps are difficult to negotiate.
- A step of even an inch at the bottom of a curb ramp may cause my wheelchair to overturn if I 'take a run' at the ramp.
- I am afraid of curb ramps that direct me outside of the street crossing into the traffic.
- I am afraid of using curb ramps because some of them do not direct me into the crosswalk.
- I prefer curbs to curb ramps for descent.
- I am concerned that I may not detect the curb ramp and wander into the road by mistake.
- I am concerned that I may not notice the curb ramp and fall.
- At intersections, curb ramps are often located so that I must travel across them if I wish to go around the corner. This is difficult and sometimes hazardous for me to do, because the ramp flares are so steep.
- Some curb ramps are very difficult for me to use because I must make an abrupt turn at the top or bottom in order to continue to move in the desired direction.
- Very often there is a curb ramp on one side of the street only.
- Unlike curbs, curb ramps do not provide visually impaired people with an edge on which to wait for the traffic lights to change.
- Frequently, curb ramps are located by a gutter, or where storm water flows when it rains, and this leaves the bottom of the ramp slippery.
- In some locations, curb ramps serving two crosswalks at right angles to each other are placed close together. This creates an area of undulating ground that is uncomfortable and hazardous.
- Where curb ramps project into the street, I am concerned that vehicles may ride over the ramp where I am waiting.
- Some ramp surfaces are finished with gravel (for detection by the visually impaired). If this gravel becomes loose, the ramp becomes slippery.

- Some ramp surfaces are finished with a rough texture that is difficult to sweep clean, and loose materials may cause slips and falls.
- Grooves and patterns cast into curb ramps tend to collect water, ice and other materials, and this makes the ramps slippery.
- Some curb ramps are painted. The paint may clog the surface and make the ramp more slippery.
- Some curb ramps are located next to planters, poles, etc., which obstruct my view of traffic, and hide me from the view of vehicles.

8. EDUCATION, LEGALITIES AND PEDESTRIAN RIGHTS:

- The law relating to pedestrians seems to vary from state to state.
- I have had insufficient training in road crossing.
- I have had no training in road crossing.
- I have to be very cautious when I cross the road because vehicles often exceed the speed limit.
- If traffic laws were more rigidly enforced, it would be easier for me to cross roads.
- I cannot move around the city because traffic laws that protect my rights are not enforced.
- I am concerned that motorists may not know the laws relating to white canes and guide dogs.
- It is difficult for me to cross roads at night or in bad weather because vehicles do not reduce speed to allow for these adverse conditions.

barriers

1. DOORS:

- Some entrance doors are impossible for me to open because of springs or the force of the wind, etc.
- Some entrance doors are difficult for me to open because of springs or wind, etc.
- I have difficulty opening all manually operated doors.
- Revolving doors are difficult for me to use.

- Revolving doors are impossible for me to use.
- Doors often are not wide enough for me to go through.
- Entrances I can use are frequently through service yards and other out-of-the-way places.
- I am apprehensive of bumping into glass doors and partitions that I may not see.
- I often find it difficult to find the door when the door is of glass and positioned in a glass partition.
- I often use my wheelchair to push open doors.
- I cannot use some doors because there is insufficient room for the open door and the wheelchair at the same time.
- I often find the space between the end of a flight of steps and a door is inadequate for me.
- Entrance doors which are served by walkways with steep grades are very difficult for me and other wheelchair users to open.
- Before I go through doors which have closers, I have to prop open the door.
- I often find that the lobby between two doors is too small for me to negotiate.
- It is difficult for me to use turnstiles.
- It is impossible for me to use turnstiles.

2. DOOR KNOBS, ETC.:

- I have difficulty using round door knobs.
- I have difficulty using lever type door knobs.
- I find that most handles are too small for arm operation.
- Where doors have no knobs it is difficult to know where to pull or push on them.
- It is impossible for me to open fire doors which have panic bars.
- It is difficult for me to open fire doors which have panic bars.

3. THRESHOLDS:

- I cannot negotiate raised thresholds.

- I have difficulty negotiating raised thresholds.

4. ESCALATORS:

- I cannot use escalators.
- I am frightened to use escalators.
- It is difficult for me to get on and off escalators.
- It is difficult for me to see the edges of escalator treads.

5. ELEVATORS:

- Elevator doors usually close too quickly for me.
- Closing elevator doors often bump against me before they open again.
- Some elevator doors are too narrow for me to negotiate.
- Some elevator cabs are too small for me to turn my wheelchair.
- I often cannot find elevator buttons.
- I often cannot reach elevator buttons.
- I cannot operate recessed buttons.
- Ash trays sometimes restrict my access to elevator buttons.
- When using elevators in tall buildings with which I am not familiar, it is difficult for me to find the right button.
- When the elevator arrives, for which I have been waiting, I cannot tell whether it is going up or down.
- The crack between the elevator and floor is often too wide.
- I often find that the elevator cab does not stop level with the floor.
- I am afraid of being trapped in an elevator.
- I am sometimes afraid of being trapped in the elevator because it moves so smoothly I cannot tell that it is moving.
- I am afraid of crime in elevators.

6. TELEPHONES:

- I cannot get into phone booths.
- I can only get into phone booths with difficulty.
- I cannot put money into the slot.
- I can put money into the slot with difficulty.
- Because I am slow in putting in money or dialing, I am often disconnected, and cannot complete my call.
- I cannot hold telephones.
- I can hold telephones with difficulty.
- Pay phones are often too high for me.
- Telephone cords often are too short.
- The counter prevents me from reaching the pay telephone.
- It is too tiring for me to stand when telephoning.
- Outside noises make it difficult for me to hear on pay telephones.
- Phone booths are often too dark for me to read the phone book.
- Phone dials are impossible for me to use.
- Phone dials are difficult for me to use.
- Touch phones are confusing to me.
- Touch phones are difficult for me.
- Touch phones are impossible for me to use.
- Because of my physical condition, I cannot locate public telephones.
- I cannot use a telephone unless it has special equipment.

7. DRINKING FOUNTAINS:

- Many drinking fountains are too high for me.
- Many drinking fountains are too low for me.

- Some people cannot lean over drinking fountains and must use cups.
 - I cannot use hand-operated water controls.
 - I can use hand-operated controls with difficulty.
 - I cannot use foot-operated water controls.
 - I can use foot-operated water controls with difficulty.
 - Because of my disability, I cannot locate drinking fountains.
8. REST ROOMS:
- I find that most rest rooms are inaccessible to me.
9. OTHER:
- The support wires for lighting poles, etc., are a hazard to many visually impaired people who cannot detect them.
 - Mailboxes are difficult for me to use.
 - Because of my disability I cannot locate mailboxes.
 - I bump into protective barriers because they are too high to be detected by my cane.
 - Trash receptacles are difficult for me to use.
 - It is difficult for me to make sharp turns.
 - Counters in shops, etc., are often too high for me.
 - Street furniture often blocks the passage of people in wheelchairs.
 - Corridors and aisles are often not wide enough for me.
 - Because I have no vision, I find it difficult to find my way around many buildings.
 - I often find that I cannot reach or operate fire alarm buttons.
 - I cannot hear fire alarm or emergency vehicles.
 - Some fire hydrants (and other street furniture) have sharp projections which are hazardous, particularly for people with impaired vision.
 - Low, overhanging signs, awnings, and tree branches are hazardous, particularly for those with impaired vision.

- I cannot use trash cans that require you to use two hands.
- Many vending machines are too high or too low for use by handicapped people.
- Many vending machines have controls and coin slots that cannot be used by people who have limited manual dexterity.

public transportation

1. BUSES:

- I don't get enough time to board buses.
- I don't get enough time to sit after paying my fare before the bus moves off.
- I don't get enough time to leave buses.
- The bus often doesn't stop close to sidewalk, making the first step up or down too great for me.
- On buses, there is not enough support to aid my access or egress.
- I cannot stand on buses.
- It is difficult for me to have the exact change ready.
- I have to temporarily set my prosthesis aside in order to climb aboard buses.
- If the bus does not stop with the door aligned with the bus stop, it is difficult for me to locate the door.
- Because of my physical condition, I find it difficult to travel from the bus stop to the shopping center across the shopping center car park.

2. TRAINS/SUBWAYS:

- I cannot cross the gap between the vehicle and platform.
- I can cross the gap between the vehicle and the platform with difficulty.
- The long flights of stairs up to elevated railway platforms are difficult for me to climb.
- The long flights of stairs up to elevated railway platforms are impossible for me to climb.

3. AIRPLANES:

- It is difficult for me to find my way around airports without assistance.

- I frequently cannot understand airport signs.
- I cannot see airport signs.
- It is frequently too far for me to walk without assistance.
- I am sometimes denied passage by airlines.
- Aisles on airplanes are too narrow for me.
- Seats are difficult for me to get into, and out of, on airplanes.
- Airplane toilets are inaccessible to me.

4. TAXIS:

- Drivers sometimes refuse to accept me as a passenger.
- Drivers sometimes refuse to help me get into, and out of, the vehicle.
- Drivers usually don't know how to help me get into, and out of, the vehicle.
- Some taxi doors are too small for me.
- Some taxi seats are too high for me.
- Some taxi seats are too difficult for me to get into.

5. PUBLIC TRANSPORTATION--COMMON PROBLEMS:

- Because of my physical condition, I cannot walk far to public transportation or shops.
- I cannot climb up or down the steps of vehicles.
- It is difficult for me to climb up or down the steps of vehicles.
- I cannot read route indicators.
- I often do not know when I have reached my destination without asking.
- I cannot understand messages on the public address system.
- It is difficult for me to put coins into coin slots.
- It is difficult for me to put money into change machines.
- It is impossible for me to put money into coin slots.

- It is impossible for me to put money into change machines.
- I am afraid of being knocked off balance by vehicle doors which close too quickly for me.
- I am afraid of losing my balance on moving vehicles.
- I need poles, etc., to hold onto on moving vehicles.
- Straps and poles are difficult for me to hold.
- I need a wider seating space than is usual.
- I am afraid of crime while traveling in public transportation.

automobiles

1. CARS:

- I cannot open car doors on hills. They are too heavy.

2. CAR PARKS:

- Parking spaces are often too narrow.
- Parking spaces reserved for the handicapped are often used by the able bodied.
- It is hazardous for people in wheelchairs to have to travel behind a row of cars in parking lots. The drivers of cars backing out may not notice them.
- Parking spaces are often too far away from my destination.
- New pedestrian malls often exclude the handicapped because they have to park too far away from their destination.
- There are often barriers between parking places and destinations.
- It is difficult for me to find my way in parking lots without assistance.
- It is difficult for me to use car parking spaces unless they are level.
- Many parking garages have ceiling heights that are too low for the specially adapted van that I use.
- It is impossible for me to find my way in parking lots without assistance.
- I am concerned about crime in car parks.
- I cannot get tickets from parking ticket dispensers.

- It is difficult for me to get tickets from ticket dispensers.

3. HIGHWAYS:

- Rest areas on highways are often not accessible to me.
- Highway shoulders are often not wide enough to permit me to leave my vehicle.

4. GENERAL/CAR:

- Because of my physical condition, I need special parking privileges.

Establishing Research Priorities

Approximately 750 problem statements have been listed and these are subdivided into 14 categories and 55 subcategories. This list of statements is not exhaustive but it probably covers the most obvious of the problems experienced by elderly and handicapped pedestrians.

Not all of the statements fall comfortably within the scope of the present research. However, they have been retained on the list because they indicate problems which seem to require attention. Into this category fall many of the statements that reflect perceptions of societal and attitudinal responses, such as:

- public doesn't believe a person is deaf if he can speak.
- some handicapped people are mistaken for drunks.

Obviously, the survey provided very limited evidence that these statements are true, and no evidence on the universality of these attitudes. Nevertheless, they can be considered as plausible hypotheses for future evaluation, and their inclusion is necessary for an understanding of the overall problem.

The statements that fall within the scope of the study have been treated in one of several ways. If the stated problem seems to be self evident with obvious and well known solutions, then the problem and recommended solutions have been presented in the "Implementation Package". As an example of problems of this type we have:

- snow and ice are frequently not cleared from the sidewalk.

No further research is needed to test the general validity of the comment, nor to establish that people in wheelchairs, and people on crutches particularly, are adversely affected by this condition.

The remaining statements can be divided into two types--those where the validity of the statement remains in doubt, and those where the statement is probably valid but the solutions are either unknown or are suspect. In both cases, further research is needed. However, the number of problems stated in this group is far more than could be treated

within the financial and time constraints of the contract. It was therefore necessary to reduce the number to a manageable quantity.

Several methods of selecting problems for further work were considered. One method that was rejected would have involved the development of a highly structured survey based on the statements. The survey would thus have provided a measure of the popularity of each statement included. This method was rejected, firstly, because of the time and expense constraints, but also because the results would have favored statements that affect the majority rather than the minorities. A problem that is unique to the visually impaired, say, would be unlikely to be popular with the whole target population because the visually impaired constitute a relatively small part of the population.

Finally, it was decided to make use of the opinion of a panel of experts to make a final selection of the problems to be dealt with further. The panel was chosen to include people who would represent each of the target subgroups. The prime responsibility of each panel member therefore, was to speak for the group he or she represented.

Each representative selected suffered from the same disability as the members of his or her constituency, and was also an expert in mobility, so the consumers were well represented. It was hoped that by this procedure a consensus could be developed that did not exclude problems that were central to all of the minority groups represented. And in the event, the procedure seems to have been highly successful.

Before the panel convened in Atlanta, the members were asked to help determine the extent to which each of the problem statements affected their constituencies. This was done in order to familiarize them with the statements and to aid them in forming their opinions as to which problems should be addressed. Each panel member was given a list of all of the problem statements and asked to answer two questions about each statement:

- What percentage of the people in your subgroup (visually impaired, deaf, etc.) do you think are affected by this problem?
- How confident are you that your answer to the above is correct—expressed as a percentage?

So, for example, to the statement, "Ramps are difficult for me," the panel member who uses crutches answered as follows:

"70% of those who use crutches would concur with the statement and I am 60% certain that my estimate is reliable."

After completing this task each panelist was asked to rank order a list of 18 problem areas—the problem areas being groupings of problem statements.

The overall rankings generated by the panelists are as follows:

1. Safer and easier ways to cross streets.
2. Provision for changing levels (nonmechanical).
3. Fire emergency provisions for the elderly and handicapped.
4. The design and location of mailboxes, parking meters, litter boxes, street lamp poles and signs, and other street furniture.
5. Signs and signal lights.
6. The problems at curbs, and curb ramp design.
7. Better location of cues for the visually handicapped.
8. The provision of toilet facilities, accessible to elderly and handicapped pedestrians using the streets.
9. Lighting and illumination at night.
10. The design of doors of all sorts.
11. The lack of places to rest in safety and comfort.
12. The design of elevators and their control system.
13. The design and provision of handrails and guardrails.
14. The design of materials used for walkways.
15. The design of escalators.
16. Parking and automobile access and egress problems.
17. The affects of street crime.
18. Congestion and crowding on walkways.

Again, the purpose of this task was to assist the panel member in formulating their veiws of the most urgent and the most important needs of their constituents. Not all of these statements fall within the scope of the project, but for this stage of the process, an overview of the whole list of problem statements was sought.

After completing these two tasks, the panelists were brought to Atlanta for a two day meeting. The goal of the meeting was to arrive at a consensus opinion in the form of a list of the most important problem areas that should be examined during the rest of the project. A second goal was to discuss these problem areas and to suggest possible

countermeasures that could be evaluated.

At this stage, several of the previously ranked problem areas were removed from consideration for the following reasons:

- Fire emergency provisions—outside the scope.
- Signs and signal lights—being considered in another study.
- The design of doors—outside the scope, and being considered in another study.
- The design of elevators—outside the scope, and being considered in another study.
- The design of escalators—outside the scope.

The panel agreed that all of the remaining problem areas should be considered further, with the greatest emphasis being placed on those with the higher rankings.

In the final phase of the work of the panel, a large number of potential countermeasures were discussed and several of these were later developed for evaluation. These include:

- Design parameters for short ramps.
- Several different curb ramp layouts.
- The layout of street furniture to assist the visually impaired.
- The use of surface textures to inform the visually impaired.
- Restrictions in the right-turn-on-red rule in certain circumstances.
- Widened crosswalks.
- Accessible pedestrian islands on wide streets.
- A painted vehicular warning pattern for mid-block crossings.
- Extended sidewalks at certain intersections.
- Painted warnings to emphasize existing hazards such as manhole covers, and gratings.

These countermeasures have been evaluated either in laboratory studies or in the field, and this work is described in Volume 3, "The development and evaluation of countermeasures." Finally, the results of these studies have been incorporated into the "Implementation Package".

introduction

The first legislative steps directed at the elimination of architectural barriers have occurred only within the past two decades. As an emerging area of legislation, barriers removal laws lack definition and remain in a state of flux. Definitions of such words as "handicapped," "disabled," and "rehabilitation" have had to be considered and scrutinized so that on the one hand they do not exclude people who are in need of assistance, but on the other hand do not become so inclusive that they refer to the entire population.

On the positive side, in this fairly short time span national legislation has been enacted, and all of the states now have barriers removal laws. The American National Standards Institute has generated a standard which forms the basis for most barriers removal regulations (and their standard is currently being completely reexamined).

On the negative side, however, there are quite bewildering differences in the approaches to the laws enacted and their interpretation. Compliance with these statutes has been inadequate. There are too many loopholes, too little enforcement, and too few sanctions for noncompliance. Much of the legislation, particularly at the state level, affects a comparatively small part of the constructed environment.

For the elderly and handicapped pedestrian, the legislation has had little impact up to now because it has been primarily directed at buildings and, in particular, at buildings financed with federal or state funds. The sidewalks, streets, street crossings, public open spaces, parking lots, building sites, shopping centers, parks and recreation areas that are under the legal control of cities, towns, counties and local authorities remain substantially inaccessible and unaffected by legislative mandates to remove barriers.

The legislative review that is the subject of this report was carried out as part of a much larger literature review directed at examining the state-of-the-art of providing for elderly and handicapped pedestrians. The search is not an in-depth analysis of all legislation that addresses architectural barriers. It is not directed, primarily, at barriers within buildings, nor does it discuss legislation at levels below that of states. The survey of states includes legislation through the middle of 1975, and the other sections include materials to the middle of 1977, plus certain significant federal laws passed late in 1977 and during 1978.

This part very briefly charts society's changing view of handicapped people and how this has affected legislation; discusses the most significant federal laws and regulations and standards; compares the laws of the fifty states and the District of Columbia (up to the middle of 1975); briefly discusses the national construction codes and standards and their provisions including the American National Standards Institute Standard Specifications; deals with the private sector; draws conclusions and makes some suggestions for the future development of measures to improve the effectiveness of legislation aimed at barrier-free design.

history

Society's perceptions of and attitudes toward handicapped people have varied greatly over time and from place to place. To some cultures handicapped individuals were perceived as a threat to the fitness, and therefore the survival, of those particular groups. Early Roman law, for example, allowed a father to destroy his handicapped children. On the other hand, early Christians regarded physical disability as a way to salvation. But it was not until 1601 that the Poor Relief Act was passed in England. This act provided the first evidence that society was willing to accept handicapped people as part of society and undertake a measure of responsibility for them.

In most countries, programs for the care and training of physically handicapped children and adults began with private and voluntary organizations, which brought to public attention the needs of the handicapped by establishing and maintaining direct service projects. Modern programs for physically handicapped people developed from the activities of organized charities which started in the nineteenth century. Throughout the twentieth century government agencies have assumed increasing responsibility for providing services to handicapped people, with private agencies supplementing these public services where there was a perceived need.

In 1917, soon after the United States entered World War I, the first rehabilitation center in the United States was established. This was the Red Cross Institute for the Disabled, now called the Institute for Crippled and Disabled, in New York City. In the same year, Minnesota passed a law that provided for vocational rehabilitation; and Massachusetts followed suit in 1918.

Congress became interested in vocational rehabilitation and gave money to states for programs. As a result, the 1917 Smith-Hughes Act, Public Law 347, which was aimed at vocational education, was enacted. This was followed by the Rehabilitation Act of 1920, which promoted vocational rehabilitation for those disabled in industry. However, it did not provide for medical and physical restoration services. Rehabilitation services for the war-disabled were authorized the previous year.

By World War II, the need to keep large numbers of people in the work force and to assist those disabled in the war gave the program new impetus. In 1941, President Roosevelt asked for a plan for rehabilitation services, but the emphasis was still primarily economic. The Barden Bill, Public Law 113, which resulted from this thrust provided further assistance to states for vocational rehabilitation including additional types of services such as transportation, tools, and equipment.

In 1943, the Office of Vocational Rehabilitation was established, and the emphasis began to change, partly as a result of amendments to Federal legislation. It became clear that disability was no handicap to war production, and employment of the handicapped was deemed "a rational and cultural economic necessity in a healthy society."

In the states, vocational rehabilitation was given new status accompanied by new rights and responsibilities. At that time the state vocational rehabilitation agencies were lacking in personnel trained to carry out the new responsibilities, but this potential

drawback resulted in greater cooperation among many agencies and organizations through mutual need.

With the end of the war, disability was perceived as a problem of great magnitude. In addition to disabled veterans, there was an increasing number of workers disabled by transportation and industrial accidents. The Vocational Rehabilitation Act Amendments of 1954 Public Law 83-565 were enacted to provide a stronger financial structure, training programs for professionals, better rehabilitation for a greater range of disabled people, and to authorize expansion of rehabilitation facilities.

The first coordinated efforts toward removal of architectural barriers began in this country through the National Easter Seal Society for Crippled Children and Adults, and the President's Committee on Employment of the Handicapped. On May 1, 1959, in conjunction with the annual meeting of the President's Committee on Employment of the Handicapped, people interested in the problem of architectural barriers were asked to meet with the American Standards Association (now the American National Standards Institute—ANSI),³⁹ and a task force was formed to develop a set of standards. The Easter Seal Society provided the principal financial support. Leon Chatelain, Jr., an architect, became Chairman of the task force, and Timothy Nugent, Secretary. People from some fifty groups concerned with the problem participated. A review of the Department of Labor guide on this topic and studies of barrier-free design were carried out at the University of Illinois under Nugent,⁴⁰ who had been a leader in establishing standards for his university. The University of Illinois became a testing ground for proposed American National Standards Institute Standard Specifications.

On October 21, 1961, the American Standard Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped was approved by the American Standards Association and labeled ASA A117.1-1961, now American National Standards Institute A117.1-1961.³⁹ Copies of the American National Standards Institute Standards were distributed by the President's Committee early in 1962 to heads of all federal departments and agencies, who were urged to incorporate the Standards into the planning and design of all new federal structures.

During the 1960's, Iowa and Pennsylvania passed legislation requiring entrance ramps in state-owned buildings of over fifty thousand square feet of area. In 1962, Massachusetts passed the first state law to eliminate architectural barriers in public buildings. The Massachusetts law was based on a model but rather permissive bill designed by the Easter Seal Society for adoption by the states. Also in 1962, the Vocational Rehabilitation Administration set out on a three-year effort to support programs to eliminate architectural barriers.

On May 7, 1963, South Carolina became the first state to adopt in full the Standard of the American Standards Association and make them mandatory. This set the precedent for other states, and the Council of State Governments, which encourages uniform state legislation, proposed draft legislation based on the South Carolina law and advice from the Vocational Rehabilitation Administration and other units of the Department of Health, Education and Welfare. The Council endorsed The Model Law in August of 1964.

On November 8, 1965, the Vocational Rehabilitation Act Amendments of 1965, Public Law 89-333, became law. Section 15 of the Act established, in the Department of Health, Education and Welfare, a National Commission on Architectural Barriers to Rehabilitation of the Handicapped. Mr. Leon Chatelain, Jr., became Chairman of this ad hoc study group in 1966. The Commission was to study the general problems of making facilities and structures of all kinds available to handicapped people. The study concerned public and private sector activities regarding the extent to which architectural barriers impeded access to, or use of, facilities in all types of buildings. The first report, completed in 1967, recommended that legislation be enacted to require: that all Health, Education and Welfare facilities intended for use by the public and leased or owned by the Federal government be designed barrier-free; that barriers be removed from existing Federal buildings used by the public to the fullest extent feasible; that non-Federal organizations which receive Federal funds for construction directly or through grants to states meet the same Federal standards; that the Department of Health, Education and Welfare play a major role in working with other executive agencies to develop standards. These recommendations were substantially adopted in legislation introduced in the House, H.R. 6589.⁴¹ State Divisions of Vocational Rehabilitation were expected to concern themselves with the problem and were deemed important in carrying out direct assistance programs under Public Law 89-333. The Commission looked to state agencies for ideas and suggestions. The Department of Health, Education, and Welfare gave guidance by issuing its Facilities Planning and Construction Manual, which incorporated American Standards Association Standards and applied the standards to all construction authorized by Health, Education and Welfare. The Vocational Rehabilitation Act was further amended in 1967, and in 1968,⁴² when the temporary authority for the Commission's activities was no longer valid, the language in the Act relating to the Commission was deleted.

Sections, 202, 221 and 231 of the Housing Act of 1964, Public Law 89-117, provided for a wide range of federally assisted housing programs designed to meet the need for suitable housing for the handicapped. Previously the only Federal housing program for people with service-related handicaps was in the Veterans Administration. By 1965, the Housing Act, Public Law, 89-117, gave parity to the handicapped and elderly for low-rent housing.

These laws marked the beginning of increased legislation benefitting handicapped and elderly people. With the passage of the "Architectural Barriers Act" in 1968, there started a new era of significant attention to the needs of elderly and handicapped individuals, especially with regard to barrier-free design.

most significant recent federal laws affecting barrier-free design

Many laws have been enacted by Congress in recent years which reflect the growing awareness of the needs of handicapped individuals to become participating United States citizens and their dissatisfaction with various Federal agencies' attempts at meeting these needs. One mandate of the legislation was that facilities used to house

programs in which disabled people wish to participate be accessible. Following are the most significant of these laws.

1. "Architectural Barriers Act" (Public Law 90-480, 1968). An Act to Ensure that Certain Buildings Financed with Federal Funds are so Designed and Constructed as to be Accessible to the Physically Handicapped.⁴⁵

Congress recognized that approximately twenty-two million physically handicapped people were restricted in their movements and that these people were a valuable asset to society and must be afforded every opportunity to enter the mainstream of American life. Congress also realized that it had to mandate minimum accessibility standards since voluntary barrier-free standards had not assured disabled people total accessibility to and utilization of Federal Government programs. The historical activity and concern for access for the elderly and handicapped was a prologue to Public Law 90-480, the "Architectural Barriers Act" of 1968. This law states:

"...the term 'building' means any building or facility (other than (A) a privately owned residential structure and (B) any building or facility on a military installation designed and constructed primarily for use by able-bodied military personnel) the intended use for which either will require that such building or facility be accessible to the public, or may result in the employment or residence therein of physically handicapped persons...which is constructed, altered or leased on behalf of the United States, or is financed by a grant or loan made by the United States subject to this Act. Every building designed, constructed, or altered after the effective date of a standard issued under this Act which is applicable to such building, shall be designed and constructed, or altered in accordance with such standard."

The General Services Administration, in consultation with the Secretary of Health, Education and Welfare, "...is authorized to prescribe such standards...." The Secretary of Housing and Urban Development, and also the Secretary of Defense, each in consultation with the Secretary of Health, Education and Welfare, is authorized to prescribe standards for their departments "...to insure that physically handicapped persons will have access to, and use of, such buildings." The Administrator of General Services, with respect to standards issued under this Act, is authorized:

1. To modify or raise any such standard on a case-by-case basis, upon application made by the head of the department, agency, or instrumentality of the United States concerned, and upon a determination by the Administrator or Secretary, as the case may be, that such modification or waiver is clearly necessary; and
2. To conduct such surveys and investigations as he deem necessary to insure compliance with such standards.

The "Architectural Barriers Act" has been amended twice. The first time was on March 5, 1970, following a hearing in December of 1969 before the Subcommittee on Public Buildings and Grounds⁴⁴ and the Committee on Public Works of the House of Representatives. This became Public Law 91-205 Washington Metropolitan Area Transit,⁴⁵ and brought the Washington Metropolitan Area Transit System under the

scope of the Act. This legislation was needed since the Washington Metropolitan Transit Authority technically is not a Federal agency. It is significant that legislative history clearly reflects that rolling stock is not subject to, or covered by, Public Law 90-480. The second amendment, Public Law 94-541, Title II, was passed October 18, 1976.⁴⁶ It reflects changes as noted in the first Report⁴⁷ by the Architectural and Transportation Barriers Compliance Board, established under the Rehabilitation Act of 1973.⁴⁸

That amendment identified four reasons why there was non-compliance with the Architectural Barriers Act of 1968.

1. The law contained exemptions for the Department of Defense and the Department of Housing and Urban Development;
2. Many federally funded buildings were under design, construction or modification when the bill was passed, and many existing federal facilities remained essentially inaccessible;
3. There was a lack of funding to hire adequate staff to conduct compliance surveys and investigations; and
4. There was a lack of enforcement because deficiencies found through investigations could only be reported to the involved agency.

This new legislation (Public Law 94-541, shown in Table 16) reflects a continued awareness of the need for barrier-free design and clearly mandates that those Federal agencies enumerated in the "Architectural Barriers Act" ensure that public buildings be made accessible to physically handicapped people by changing permissive language such as "is authorized to prescribe" to "shall prescribe." The section on leasing was strengthened to include all leased buildings or parts thereof, including renewals of leases and leases of buildings for subsidized housing programs which must be accessible and usable after January 1, 1977. Postal Service buildings are now covered under the Act. The General Services Administration must now report annually to Congress and to those other groups covered under the "Architectural Barriers Act"; and the Architectural and Transportation Barriers Compliance Board is to report on its compliance activities to the Public Works and Transportation Committee of the House of Representatives and the Environment and Public Works Committee of the Senate. These requirements reflect the expectation of Congress that the Architectural and Transportation Barriers Compliance Board will responsibly execute its mission.

2. Rehabilitation Act of 1973, Public Law 93-112. Title V.⁴⁹

Section 501 - Employment of Handicapped Individuals.

This section provides "a focus for Federal and other employment of handicapped individuals" to be enforced by the Civil Service Commission.

Table 16: Affirmative Action Provisions of the Rehabilitation Act of 1973, as Amended

SECTION OF ACT	TITLE OF SECTION	COVERAGE	PROVISIONS	ADMINISTERING AGENCY	APPLICABLE REGULATIONS
Section 101 (a) (6)	VR State Plan Administration	State rehabilitation agencies and facilities	Agency to take affirmative action to employ and advance in employment qualified handicapped individuals	Rehabilitation Services Administration	Federal Register Vol. 40, No. 75, pp. 54696-54731, November 25, 1975
Section 501	Employment of Handicapped Individuals	Departments, agencies and instrumentalities in the executive branch of the Federal Government	Agency to have affirmative action program for hiring, placement and advancement of handicapped individuals. Plan to be updated, reviewed and approved annually	U. S. Civil Service Commission	U.S. Civil Service Commission, Federal Personnel Manual, Chapter No. 306
Section 502	Architectural and Transportation Barriers Compliance Board	Composed of the heads (or designees) of nine federal agencies	To insure compliance on accessibility and usability of buildings constructed with Federal funds; to investigate, examine and recommend methods of eliminating architectural, transportation and attitudinal barriers confronting handicapped persons	Architectural and Transportation Barriers Compliance Board	Architectural Barriers Federal Register, Vol. 41, No. 128, pp. 27192-27196, July 1, 1976
Section 503	Employment under Federal Contracts	Contractors of the Federal Government with contracts of \$2500 or more	Contractor to take affirmative action to employ, advance in employment and otherwise treat handicapped individuals without discrimination based on their handicap in all employment practices	Office of Federal Contract Compliance Programs, Department of Labor	Federal Register, Vol. 41, No. 75, pp. 16147-16155, April 16, 1976
Section 504	Nondiscrimination under Federal Grants	All programs and activities receiving federal financial assistance	No qualified handicapped individual shall, on the basis of handicap, be excluded from, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity receiving federal financial assistance	Office of Civil Rights Department of Health Education and Welfare	Proposed Regulations Federal Register, Vol. 41, No. 138, pp. 29548-29567, July 16, 1976

Section 502 - Architectural and Transportation Barriers Compliance Board.

Section 502 established an Architectural and Transportation Barriers Compliance Board,⁴¹ composed of heads of, or their executive level designees, from eight agencies: the Department of Health, Education and Welfare; Department of Transportation; Department of Housing and Urban Development; Department of Labor; Department of the Interior; General Services Administration; United States Postal Service; and the Veterans Administration.

The Board shall:

- (1) Insure compliance with standards set down by General Services Administration, Department of Defense, and the Department of Housing and Urban Development in accordance with the "Architectural Barriers Act" of 1968, (Public Law 90-480) as amended by the Act of March 5, 1970, (Public Law 91-205);
- (2) Investigate alternative approaches to architectural, transportation, and attitudinal barriers;
- (3) Determine necessary measures to be taken by various governmental levels to correct these barriers;
- (4) Promote and use the International Accessibility Symbol; and
- (5) Make reports and recommend necessary legislation and administration to the Congress and the President.

The Compliance Board also shall determine how and to what extent transportation barriers impede mobility of elderly and handicapped people and ways in which travel expenses to and from work can be met or subsidized when such people are unable to use mass transit systems, or need special equipment in private transportation; and consider needs for housing for handicapped persons. It shall determine measures being taken to eliminate barriers from present and future transportation systems and to make housing available and accessible to handicapped persons or meet sheltered housing needs. In addition, the Board shall prepare proposals for goals for adequate housing and transportation systems including ways to bring cooperative effort among agencies, organizations and groups already involved or whose cooperation is essential to a cooperative effort. The Board shall conduct investigations, hold public hearings and issue orders to insure compliance. An order of compliance issued by the Board shall be a first order for purposes of judicial review. The Board may appoint as many hearing examiners as needed. The department or agencies involved in this Act shall supply assistances.

From the foregoing statements, it appears that the reasons for non-compliance with the "Architectural Barriers Act," Public Law 90-480 stated by the Compliance Board in its first annual report were noted and remedial legislation passed.

Section 503--Employment Under Federal Contracts

This section states: "Any contract in excess of \$2500 entered into by any Federal department or agency for the procurement of personal property and non-personal services (including construction) for the United States shall contain provision that, in employing persons to carry out such contract, the party contracting with the United States shall take affirmative action to employ and advise in employment qualified handicapped individuals as defined in Section 7 (6)." This section is enforced by the Department of Labor, and does not include exclusively private activities.

Section 504--Non-discrimination Under Federal Grants.

"No otherwise qualified handicapped individual in the United States, as defined in Section 7 (6), shall, solely by reason of his handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program receiving Federal assistance." Enforcement of this section is the responsibility of the Department of Health, Education and Welfare, including the Office of Civil Rights, Section 504, also, does not include private programs.

The Rehabilitation Act Amendments of 1974, Public Law 93-156.⁵⁰

This amendment to Public Law 93-112, The Rehabilitation Act of 1973, provides evidence of Congressional intent to increase its commitment to handicapped people. In Titles IV and V of the Act, the definition of handicapped people has become more global, with emphasis on major life activities instead of employment. It requires that state agencies and others who receive Federal funds under this title take affirmative action to employ and promote qualified handicapped persons; and that recreational activities be fully accessible. It adds the Department of Defense to the Architectural and Transportation Barriers Compliance Board (making the Board now composed of nine agencies); makes the Secretary of Health, Education and Welfare Chairman of the Compliance Board; and adds a consumer Advisory Panel, a majority of the members of which shall be handicapped individuals, to provide guidance, advice and recommendations to the Board. It strengthens the power of the Compliance Board by authorizing the withholding of Federal funds to agencies found not in compliance. This Amendment also authorized the President to convene a White House Conference on Handicapped Individuals to "...develop recommendations and stimulate a national assessment of problems and solutions to such problems, facing individuals with handicaps." This Conference was held in May, 1977, and recommendations have followed.

Rehabilitation, Comprehensive Services, and Developmental Disabilities Amendments of 1978. Public Law 95-602 (HR-12467)⁵².

Relative to the Rehabilitation Act of 1973: Titles I through III have been expanded, Title IV has been replaced with one entitled the "National Council on the Handicapped," Title VI, the "Employment Opportunities for Handicapped Individuals Act", and Title VII, "Comprehensive Services for Independent Living", have been added. Title V amends the Developmental Disabilities Services and Facilities Construction Act and is entitled the "Developmental Assistance and Bill of Rights Act."

This act extends basic programs established in the Rehabilitation Act of 1973. Certain changes have been made to some of these programs, however. These include:

- (1) A revised allocation formula for Vocational Rehabilitation Services monies;
- (2) Research and Training Centers are moved under a newly established National Institute for Handicapped Research instead of the Rehabilitation Services Administration and allows research and demonstration projects for children and elderly;

- (3) Grants may be awarded to operate Comprehensive Rehabilitation Centers to provide a broad range of services;
- (4) A community services employment program for handicapped individuals is established;
- (5) A National Council for the Handicapped is established and;
- (6) Comprehensive services for independent living for handicapped individuals are provided. The Act also amends the Developmental Disabilities Services and Facilities Construction Act to revise and extend the programs under the act and changes the Developmental Disabilities definition.

Funds have not, as of December, 1978, been appropriated. Appropriation remains under a continuing resolution.

3. Executive Order 11914 was issued on April 28, 1976 by President Ford. It "directed the Secretary of Health, Education and Welfare to coordinate the Government-wide implementation of Section 504 and to define handicapped persons and discriminating practices. Each grant-making agency was directed to issue regulations consistent with HEW's."

"In May of 1977, HEW issued its final substantive section 504 regulation (42FR22676, May 4, 1977) and in January of 1978 it issued a regulation to implement its Executive order responsibility (43FR2132, January 13, 1978)."⁵³

4. Final Rule,⁵⁴ General Services Administration ensures that buildings leased by the Federal Government, as well as Federal buildings, have accommodations for the physically handicapped.

Other important items include:

- (1) The Architectural and Transportation Barriers Compliance Board has been extended and provided improved remedies and increased funding,
- (2) Client assistant programs have more than doubled in funding,
- (3) Special projects are provided for migratory workers projects, reader services for the visually impaired, the Helen Keller National Center, interpreters services for the deaf, and start-up grants for special recreation programs,
- (4) Protection and advocacy for rights of the disabled,
- (5) Grants for independent living services for older visually impaired (over 55),
- (6) Special studies for rural rehabilitation and disincentives to employment,
- (7) Section 504 of Title V of the 1973 Rehabilitation Act now applies to the Federal Government.

5. Tax Reform Act of 1976, Tax Reduction for Removal of Architectural and Transportation Barriers,⁵⁶ Public Law 94455. This Act provides that costs, up to \$25,000 for three years, incurred to make any facility or public transportation vehicle owned or leased by a taxpayer for use in connection with his trade or business more accessible to and usable by handicapped and elderly individuals are tax deductible. (Usually costs incurred to improve such property must be capitalized and depreciated over the useful life of the property.) The definition of handicapped people is identical to that used in the Rehabilitation Act of 1973.
6. Department of Transportation laws affecting transportation for elderly and handicapped persons.

Urban Mass Transportation Act of 1964, Public Law 88-365, as amended in 1970, Public Law 91-453,⁵⁶ Section 16 declared that it is a "national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services that they can effectively utilize." Under Section 6, 1½% of funds may be set aside and used to increase information and technology for elderly and handicapped mass transportation needs. Title III, Section 16(b) of the Federal Highway Act of 1973, Public Law 93-87⁵⁷ amends Public Law 91-453 by stating that the Secretary "may" set aside 2% of funds to finance programs

- (1) to states and local public roads for providing mass transportation services;
- (2) to private non-profit corporations which provide transportation services meeting the special needs of elderly and handicapped people.

Title I of this law, Section 165(b) states that the Secretary "shall assure" that transportation projects receiving Federal assistance under sections of the Act will be planned, designed, constructed, and operated to be effectively used by elderly and handicapped people. Federal Aid Highway Act Amendment of 1974, Public Law 93-643⁵⁸ Section 105(b) amends Section 165(b) of Public Law 93-87 to read "shall require." Section 228 requires curb cuts or ramps at crosswalks on streets constructed after July 1, 1976.

Department of Transportation and Related Agencies Appropriation Act of 1975 Public Law 93-391,⁵⁹ Section 315 states that rail or subway cars, buses and facilities will not be funded by the Act unless designed to meet mass transportation needs of elderly and handicapped people.

Urban Mass Transportation Act of 1964, as amended by the National Mass Transportation Act of 1974, Public Law 93-503,⁶⁰ Section 5(m) requires assurances that rates charged elderly and handicapped people in non-peak hours on the transportation projects supported by this section will be half the rate normally charged. Section 108 states that "nothing contained in this title shall require the charging of fares to elderly and handicapped persons."

During 1975, Urban Mass Transportation Agency received \$20.8 million for forty-nine projects to provide capital equipment and facilities for use by non-profit organizations

to provide transportation for elderly and handicapped. Many grants during the year involved funds for special vehicles (usually vans) for the use of handicapped passengers or for the provision of special equipment, such as lifts, on regular buses. Urban Mass Transportation Act's new requirements for Transbus provide low steps and wide doors and a ramp or lift for passengers in wheelchairs. The Urban Mass Transportation Act as amended through February, 1976 provides that all Mass Transportation provide for easy accessibility for elderly and handicapped people.

7. Older Americans Act of 1965 as amended in 1973, Public Law 9329.⁶¹

This Act has been amended three times since 1965. The original Act established an Administration on Aging. The Amendments strengthen programs to combat the most pressing problems of older Americans such as lack of transportation and poor nutrition. The Older American Act of 1965 as amended in 1974, Public Law 93-351,⁶² calls for

- (1) Housing for older persons suffering from physical disabilities;
- (2) Providing services to assist in meeting the particular needs of physically and mentally impaired older persons, to assist them to lead more independent lives; and
- (3) Multi-purpose senior centers, constructed in compliance with the Architectural Barriers Public Law 88-560.⁶³

8. The Housing and Community Development Act of 1964.

This act provided for a wide range of needs for accessible housing for elderly and handicapped people. The 1964 Housing and Community Development Act funded over 500,000 dwelling units for elderly and handicapped individuals. The Housing and Community Development Act of 1974⁶⁴ asks for approval of local housing stock for lower income persons including handicapped and elderly. It also stipulates that a Community Development Program may include special projects aimed at eliminating architectural barriers. The Housing and Community Development Act of 1977 (HR 6655 and S207) appears to be even more far-reaching.

federal regulations and standards

The Public Buildings Act of 1959, Public Law 86-249 as amended provides for financing acquisition, alteration, maintenance, operation and protection of buildings housing the civilian activity of the Federal government, and authority for this was given to the General Services Administration. General Services Administration's general functions include establishing policy and providing for the government an economical and efficient system for management of its property and records, including construction and operation of buildings, utilization and disposal of property, transportation, traffic and communications management, as well as other appropriate functions.

The "Architectural Barriers Act," Public Law 90-480,⁴³ passed in 1968, requires the heads of General Services Administration, Housing and Urban Development, and

Department of Defense in consultation with the Secretary of Health, Education and Welfare, to issue standards for Federal buildings which include those buildings and facilities constructed or altered on behalf of the United States government; buildings leased after alterations in accordance with Federal specifications; and buildings funded by grants or loans where the state authorizing the grant or loan also authorizes the imposition of construction forms and conditions. The heads of the three enumerated agencies may waive standards relative to accessibility and usability on a case-by-case basis only upon application by the head of another department or agency.

Public Law 94-541 imposes a clear statutory mandate that General Services Administration, Housing and Urban Development, Department of Defense and United States Postal Service ensure that public buildings are made accessible to the physically handicapped by requiring them to issue standards.

The Rehabilitation Act of 1973, Public Law 93-112, established the Architectural and Transportation Barriers Compliance Board (ATBCB) and mandated it to ensure compliance with the standards prescribed by the General Services Administration, Department of Defense, Housing and Urban Development and United States Postal Service pursuant to the "Architectural Barriers Act" of 1968 as amended. To carry out this mandate, the Board:

- (1) Conducts investigations to determine compliance of Federal agencies with new accessibility standards;
- (2) Holds hearings to collect or determine public opinion; and
- (3) Issues orders necessary to ensure compliance with the provisions of the Act, which is a final order.

The Rehabilitation Act Amendments of 1974, Public Law 93-516, gave the Board power to enforce compliance by withholding or suspending funds with respect to non-complying buildings. Regulations implementing Section 504 of the Rehabilitation Act of 1973 became effective June 3, 1977 and specify the American National Standards Institute Standard Specifications as the conforming standard. These regulations require, among other things, that all programs or activities and facilities must be accessible; employers may not refuse to hire qualified handicapped people if reasonable accommodations can be made; every handicapped child will be entitled to free public education appropriate to needs and must not be segregated; and all recipients of Health, Education and Welfare Funds must complete a self evaluation.⁶⁵ These regulations will have far-reaching effect with regard to barrier-free design over the years to come. Rehabilitation, comprehensiveness, and developmental disabilities amendments of 1978, Public Law 45-602 has not had regulations promulgated as of December, 1978.

The General Services Administration, in consultation with the Department of Health, Education and Welfare, developed implementing regulations, Federal Property Management Regulations,⁴² (FPMR), Sub-part 101-19.6, "Accommodations for the Physically Handicapped." These regulations replaced the earlier set of Regulations 101-17.7. The Federal Property Management Regulations prescribe the use of the "American National Standard Specifications for Making Buildings and Facilities Accessible to, and Usable

by, the Physically Handicapped," No. A117.1-1961 (American National Standards Institute Standard Specifications).³⁹

The following are brief descriptions of regulations and/or standards used by various departments. As indicated earlier all but certain Housing and Urban Development, Department of Defense and Postal Service facilities fall under the Federal Property Management Regulations 101-19.6 which require compliance with the American National Standards Institute Standard Specifications. Agency standards described are in addition to, or supplement, American National Standards Institute Standard Specifications. A few will be given as illustrations.

1. The Department of Health, Education and Welfare. Health, Education and Welfare uses the American National Standards Institute Standard Specifications, and their Technical Handbook supplements and amplifies Federal Property Management Regulations and the American National Standards Institute Standard Specifications. Buildings leased or owned by Health, Education and Welfare follow the American National Standards Institute Standard Specifications. Health, Education and Welfare funded facilities follow the Technical Handbook: Technical Handbook for Facilities Engineering and Construction Manual (Part 4, Facilities Design and Construction 4.00, Architectural Section 4.12, "Design of Barrier-Free Facilities").⁶⁶ The Health, Education and Welfare interpretation of the American National Standards Institute Standard Specifications is much more inclusive and better illustrated than the American National Standards Institute Standard Specifications. Health, Education and Welfare has responsibility for compliance with Section 504 Regulations of the Rehabilitation Act of 1973.
2. Veterans Administration. The Veterans Administration has supplemented the American National Standards Institute Standard specifications and has produced related standards: Accommodations for the Physically Handicapped: Veterans Administration Construction Standard CD-28, dated October, 1973, Office of Construction, United States Veterans Administration, 810 Vermont Avenue, N.W., Washington, DC 20420. The Veterans Administration regulations have been historically among the most widely encompassing standards since they include
 - (1) Construction or alteration;
 - (2) Leasing or renting;
 - (3) Loans or grants.Veterans Administration regulations continue to be updated. The only exclusion is a privately owned residential facility.
3. Department of Defense (DOD). This Department has issued a number of regulations and among the best is "Design for the Physically Handicapped" EM 1110-1-103, 10/15/76, issued by the Department of the Army.⁶⁷
4. Department of Housing and Urban Development (HUD). Housing and Urban Development follows American National Standards Institute Standard Specifica-

tions and The Code of Regulations, Title 24, Housing and Urban Development. Housing and Urban Development has contracted to develop new standards.

5. Department of Transportation/UMTA/FHWA. Federal Register, Vol. 41, #85, Friday, April 30, 1976, Pages 18, 234, and 18, 241, "Transportation for Elderly and Handicapped Persons." Title 49, Chapter VI, Section 609.13 "Fixed Facilities," states that all stations, terminals, buildings or other facilities, except those not intended for the public or physically handicapped persons, designed, constructed or altered on or after May 31, 1976 with Urban Mass Transportation Act assistance and intended for use by the public or for those handicapped individuals who may be employed will be altered in accordance with minimum standards approved in accordance with American National Standards Institute. Also, regulations are promulgated for rapid rail vehicles in Section 609.17.

After September 30, 1979, all buses purchased with Department of Transportation grants shall have a floor height no greater than twenty-two inches, capable of kneeling to eighteen inches above the ground and be equipped with a ramp for boarding. This vehicle is called Transbus.⁶⁸ Department of Transportation has also put out a group of publications called Technology Sharing, among which is "Transportation and the Elderly and Handicapped."⁶⁹ "Tips on Care and Safety for Deaf Drivers"⁷⁰ is also one of several publications of assistance to handicapped and elderly people put out by Department of Transportation.

The Federal Aviation Administration (FAA) has an internal policy memo requiring compliance with American National Standards Institute Standard specifications, and an advisory circular on Air Transportation and Handicapped Persons, AC 120-32,⁷¹ the most recent one being issued on March 25, 1977 as guidelines for airline personnel. Federal Aviation Administration (FAA) issued proposals regarding handicapped people. Comments were received, many of which were critical. Tests were carried out to provide further information.

The Coast Guard (under Department of Transportation in peacetime, and Department of Defense in war) prescribes American National Standards Institute Standard Specifications where feasible and appropriate. Department of Defense is now developing new standards to better meet needs.

6. Department of the Interior. The Department of Indian Affairs uses the American National Standards Institute Standard Specifications and some additional standards. The Park service has trails for the visually impaired. The Fish and Wildlife Service has placed emphasis on new public toilet facilities being made accessible. However, no regulations for national parks have been promulgated.
7. Department of Labor. The Department of Labor comes under General Services Administration Regulations for Federal buildings. They have not developed regulations of their own since they seldom have facilities under their direction. The Department of Labor will enforce compliance with Section 503 Regulations of the Rehabilitation Act of 1973.

8. Department of Agriculture. The Forest Service uses the American National Standards Institute Standard Specifications for construction at recreation sites.

state legislation (thru July, 1975)

A 1973 Survey of State Legislation to Remove Architectural Barriers⁷² prepared by the Commission on Barrier-Free Design, of the President's Committee on Employment of the Handicapped, showed that each of the fifty states had an architectural barriers law, and that the District of Columbia had an Executive Order. Effective dates of the legislation ranged from 1963 to 1971, with most falling in the mid-sixties.

Forty-two states had adopted the American National Standards Institute Standards Specifications; forty-seven states required all publicly funded buildings to comply with the standards. Three states included only state buildings; five states included publicly used but privately owned buildings; thirteen states explicitly covered remodeling. Responsibility for enforcement was clearly delineated in fourteen states where school funds were involved. Enforcement responsibility varied from state to state. Waiver clauses granting exemptions were found in sixteen of the state codes.

In 1973, ten states were drafting new legislation, nine of which proposed improvement of enforcement or increasing the scope of compliance; the content for the tenth was unknown at that time by the surveyors. Some of these proposed laws have since been introduced to the state legislatures. The 1973 study showed a great improvement over 1967, when two surveys demonstrated that only thirty-three states had architectural barriers legislation in force.

A new search of state legislation was conducted during the process of this literature review. From this study, it appears nearly all fifty states have new legislation pending or introduced. The Board of Examiners and Registrars of Architects of the Government of the District of Columbia stated in a letter to the author that it does not have an architectural barriers law or provisions in the District of Columbia building code. However, Executive Order No. 65-413 of March 30, 1965 states that all District of Columbia departments involved with construction of new public buildings shall "give consideration to the needs of handicapped people."

A compilation of the material resulting from the study is presented in Tables 17 and 18. The following should be noted:

- (1) Many states in their responses did not clearly cross-reference pertinent information. This makes it difficult to find the legislation or standards;
- (2) Many states have permissive laws with broad waivers in them. Different interpretations are possible in many;
- (3) Most of the state laws or standards either stated that they used the American National Standards Institute Standard specifications, or appeared to use them totally or in part, even though the standards were not referred to directly in many cases;

Table 17: State Laws for Design and Enforcement

General Inclusions	DESIGN CRITERIA			Public-owned buildings	Privately owned buildings	ENFORCEMENT	
	Complies with ANSI Standards	Compared to ANSI Standards				Sanctions for non-compliance	Party responsible for enforcement: single-S multiple-M
		More Inclusive	Less Inclusive				
STATE							
Alabama	+	X		X			M
Alaska	X			X			S
Arizona	+	X		X			M
Arkansas	+			X			S
California		X		X	X		M
Colorado	+			X			M
Connecticut			X ¹	X	X		S
Delaware			X				S
D.C.							Exec. Order
Florida	X			X	X	X	
Georgia	X			X			M
Hawaii	X			X			M
Idaho		X		X		X	S
Illinois		X		X	X	X	S
Indiana	+			+			S ⁺
Iowa	+			X	X		S
Kansas	X			X			M
Kentucky			X				M
Louisiana	X			X			S
Maine			X	X			M
Maryland	X			X			M
Mass.		X		X			M
Michigan	+			X	X	X	M
Minnesota		X		X			S
Mississippi			X	X			S
Missouri			X	X			M
Montana	+			+			M ⁺
Nebraska	X			X			M
Nevada	X			X			2
N.H.	X			X			M
New Jersey	+ ¹			X			2
New Mexico	+			X			M ⁺
New York			X	X			M
N. Carolina		X		X	X		S
N. Dakota			X	X			2
Ohio			X	X			S
Oklahoma			X	X			2
Oregon	+			X	X		S
Penn.			X	X		X	S
Rhode Island	X			X			M
S. Carolina	+			X		X	M
S. Dakota	+			+			S ⁺
Tennessee		X		X			M
Texas	X			X			S
Utah	+			X			M
Vermont	X			X			M
Virginia	+			+			S ⁺
Washington	X			X		X	M
W. Virginia			X	X			S
Wisconsin			X	X	X		S
Wyoming	X			X			S

Key: 1. Proposed legislation more inclusive

2. Not stated

+ Stated in 1973 Legislative Survey by President's Committee on Employment of the Handicapped.

* In part

X Criteria stated in law

All individual criteria not given

Single - One Agency

Multiple - More than One Agency

Table 18. State Laws for Site Development, Buildings, Fixtures, Controls, Etc.

State	Site Development							Buildings							Fixtures, Controls, Etc.					Comments
	ANSI	Crosswalks	Curbs	Grading of Grounds	Hazards	Parking Facilities	Public Walks	Rest Areas	Corridors	Doors & Doorways	Elevators	Entrances	Floors	Ramps	Stairs - Handrails	Controls	Warnings & Signals (Deaf)	Warnings & Signals (Blind)	Water Fountains	
Alabama	+			X	X	X	X			X	X	X	X	X	X	X	X	X	X	
Alaska	++																			
Arizona	+			X	X	X	X			X	X	X	X	X	X	X	X	X	X	
Arkansas	+			X	X	X	X			X	X	X	X	X		X		X		
California	#	X	X						X			X		X				X	X	X
Colorado	+			X	X	X	X			X	X	X	X	X	X	X	X	X	X	
Connecticut	X#																			1975 law
Delaware	++				X	X	X			X	X	X	X	X	X	X	X	X	X	
D.C.																				Exec. Order #65-413
Florida	X	X	X			X	X		X	X	X	X		X		X		X		
Georgia	X			X	X	X	X			X	X	X	X	X	X	X	X	X	X	Elevator segment weak
Hawaii	X#																			
Idaho	X#																			
Illinois		X	X	X	X	X	X			X	X	X	X	X		X	X	X	X	
Indiana	++																			
Iowa	X		X	X	X	X	X			X	X	X	X	X	X	X		X	X	"Insofar as feasible"
Kansas	X#																			
Kentucky		X	X																	Pedestrians only
Louisiana	X			X	X	X				X	X	X	X	X	X	X			X	
Maine	+			X			X			X	X		X	X	X		X	X	X	
Maryland	+	X	X																	
Massachusetts						X	X			X	X	X	X	X	X	X	X	X	X	
Michigan	++		X																	
Minnesota	+		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	Less emphasis on deaf
Mississippi					X	X	X			X	X	X	X	X	X	X		X		
Missouri			X		X	X	X			X	X	X	X	X	X				X	
Montana	++																			
Nebraska	+			X	X	X	X			X	X	X	X	X	X	X	X	X	X	
Nevada	X#																			
N.H.	X											X		X						
New Jersey	++																			Proposed legislation
New Mexico	++		X																	General only
New York				X		X	X			X	X	X		X				X	X	State Univ. more inclusive
N. Carolina	+	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	
N. Dakota	#		X			X														"Full consideration to ANSI"

Table 18. State Laws for Site Development, Buildings, Fixtures, Controls, Etc. (continued)

State	Site Development							Buildings						Fixtures, Controls, Etc.							
	ANSI	Crosswalks	Curbs	Grading of Grounds	Hazards	Parking Facilities	Public Walks	Rest Areas	Corridors	Doors & Doorways	Elevators	Entrances	Floors	Ramps	Stairs - Handrails	Controls	Warnings & Signals (Deaf)	Warnings & Signals (Blind)		Water Fountains	Access Symbol - Not included in ANSI Standards
Ohio												X		X					X		Mentions only
Oklahoma	++																				"Except elevators"
Oregon	+#																				"Full consideration to ANSI
Pennsylvania	+				X	X	X			X	X	X	X	X	X		X		X		
Rhode Island	X			X	X	X	X			X	X	X	X	X	X		X	X	X	X	
S. Carolina	+																			X	"Full consideration to ANSI
S. Dakota	+#																				
Tennessee	#	X			X				X						X					X	+Fire escapes & escalators
Texas	X			X	X	X	X			X	X	X	X	X	X		X	X	X	X	
Utah	+#																				
Vermont	X					X								X							
Virginia	+#																				
Washington	#																			X	
W. Virginia						X	X			X	X	X	X	X					X		Listed and not defined
Wisconsin											X	X	X							X	
Wyoming	#		X								X										

Key:

- * In part
- X Criteria stated in law
- # All individual criteria not given
- + Stated in 1973 Legislative Survey by President's Committee on Employment of the Handicapped.

- (4) Many of the statutes were not found directly under an architectural barriers heading, but were given under such headings as highway, traffic, pedestrian, white cane, or civil rights.

Many of these did not appear to contain cross-referencing. With the help of private organizations, the Council of State Governments, and the National Center for Law and the Handicapped, Inc., the states may be able to modify and cross-reference their laws and regulations to bring about greater uniformity.

construction codes and standards

Standards comprise those specifications and methods that have been formally adopted by an organization. Standards are recipes for some degree of success in an area. They become mandatory when referenced or quoted in a law and the word "shall" denotes requirement. The terms "codes" and "standards" are often interchanged.

Construction codes or standards and related ordinances are documents developed to protect citizens from the consequences of dangerous building practices. Typical major codes and ordinances are related to building, plumbing, electrical work, fire prevention, housing, heating and air conditioning, zoning, and sub division regulations. Local and state governments adopt and enforce these regulations for safety and for protection of public health and the general welfare through minimum requirements for construction or modification of buildings. These codes define the minimum standards of safety required for design professionals, for contractors, for citizens, and for the community in general.

Among the model codes used are

- (1) The Standard Building Code (SBCC);
- (2) National Building Code (NBC);
- (3) Basic Building Code produced by the Building Officials and Code Administrators International, Inc. (BOCA);
- (4) National Fire Protection Association (NFPA), which produces the fire code and also National Electrical Code—NFPA 70-1975; and
- (5) Uniform Building Code—put out by the International Conference of Buildings Officials (ICBO).

The Council of American Building Officials (CABO), made up of Standard Building Code Council, International Conference of Buildings Officials and Building Officials and Code Administrators, is instituting some coordinating efforts among some of the model codes to solve problems. Many groups use these codes because they offer a uniform approach, especially to the smaller community; they allow use of new materials while providing reasonable safeguards; and they are easy to maintain and update. Occasionally a

smaller community will develop its own code, but most adopt one or more of those listed above. Many cities have specialized needs, and the funds and personnel to develop their own standards in a local building code.

Standards are developed by the combined efforts, experience and abilities of many technical committees representing producers and consumers. The committees work out and agree upon the details of various specifications and methods and make recommendations to the organization. This allows opportunity for all concerned to express views and reach agreement. When approved by members, the methods and specifications carry full support of the organization. The most important standards with regard to barrier-free design are included in the American National Standards Institute Standard Specifications.

American National Standards Institute Standard Specifications for Making Buildings and Facilities Accessible to and Usable by the Physically Handicapped, (American National Standards Institute Standard Specifications) A117.1-1961.⁶⁶ ANSI--American National Standards Institute--is a standards "library." American National Standards Institute is a consensus organization, like some other such groups, which promulgate standards. These specifications regarding barrier-free design, include Scope and Purpose, definitions, General Principles and Considerations, Site Development and Buildings. Some are specific and many are general in nature. They do not include specifications for sidewalks, crosswalks or streets. They do not include reference to specific regulations which would apply to various specific types of areas such as terminals and stations. Therefore, each Federal department, as well as others, has felt the need to supplement or amplify these standards.

Mr. W.A. Nelsen, acting Commissioner, Public Building Service, GSA, states:

That Standard has not been updated since its preparation in 1961. Social, psychological and technological changes have caused many more handicapped persons to become more mobile. The original American National Standards Institute Specifications A117.1 contributed to this change but it no longer satisfied the needs of today's more mobile handicapped. Accessibility--The Law and the Reality, A Survey to Test the Application and Effectiveness of Public Law 90-480 in Iowa, lists problems and suggested solutions.

In recognition of the fact, General Services Administration and...Housing and Urban Development have separately contracted for the development of new standards to better implement their respective responsibilities under Public Law 90-480. Until...completed, we have recommended to all... regional commissions that the Handicapped Section of the North Carolina State Building Code be applied in new construction projects.

An Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code.⁷⁰ This standard applies to all buildings and facilities regulated by the North Carolina State Building Code, with the exception of single and two-family detached dwellings, small buildings already built, and historic restoration. It is mandatory in North Carolina. It encompasses the American National Standards

Institute Standard Specifications but expands on some and adds others, and is well illustrated. It includes curb ramping, walks and parking lots, and a great deal about site development. It does not contain specifics on sidewalks, cross-walks or streets and intersections. It is one of the best codes available today in the United States.

No one set of standards, like no one definition, seems likely to address all problems. But one set of standards can act as the base and serve as a general guideline for others. American National Standards Institute Standard Specifications have been used in this manner in the past. They were widely followed both in federal and state statutes. However, these standards have been widely supplemented by necessity because they no longer fulfill all general or specific needs. For these reasons Syracuse University has been awarded a contract by the Department of Housing and Urban Development to prepare revisions and additions to the American National Standards Institute Standard Specifications and to bring them up to the state-of-the-art, preparatory to submitting them to the American National Standards Institute. They will be submitted to certain individuals for comment, and to any citizen requesting to do so, before final revision and acceptance. The Advisory Panel includes designers, builders, industry people and consumers. It may take some time for rewriting and approval of the new, and much needed standards.

the private sector

Many private organizations are working towards accessibility. A few examples will show the increasing interest and concern being shown by private citizens and businesses.

The American Congress of Rehabilitation Medicine has appointed a committee on social aspects of rehabilitation to include an Architectural Barriers Task Force. Holiday Inns have made more than six hundred Inns accessible during the past nine years. Other such organizations include Disney World, McDonald Hamburgers, Hilton International, and Marriott Corporation. The Young Lawyers' section of the American Bar Association passed a resolution in 1976 supporting vigorous enforcement of barrier-free design laws. Sears did a survey of costs of accessibility and found that reasonable accommodation is "not expensive at all" for a company of their size and they practice it. Kaiser intends to revamp its twenty-seven story headquarters to facilitate disabled workers. The National Council for Interior Design is including questions on barrier-free design in its examination. The Container Corporation of America has moved to a new accessible plant. K-Mart Stores are accessible, including one check-out line in each store. Trans-World Airlines has published a brochure on services, safety aspects and policies for handicapped travelers. Several sections of the American Society of Civil Engineers have endorsed the National Policy for a Barrier-Free Environment. The National Association of Student Councils passed a resolution to strike down barriers in their localities. Many people are concerned and working toward accessibility. Many of these belong to an organization called the National Center for Barrier-Free Environment.

These are only a few of the myriad examples of private enterprise in action for barrier-free design.

definitions used in laws, regulations, standards and resource papers

Introduction Summary of Definitions

Early references to elderly and handicapped people were brief and limited. Most emphasis was placed on a job handicap and the ability to work or be returned to employment. Later, vocational rehabilitation was identified as a national and cultural economic necessity in a healthy society and mental disability also began to be emphasized. Only in the past few years has an attempt been made to deal with definitions of what constitutes a disability, by specifying problems such as cancer, amputation, cystic fibrosis, hemiplegia and mental illness, or deficits in ambulation, sight and hearing, and coordination, etc. Later definitions also include disabilities of aging as well as hidden and temporary disability problems.

The most recent legislation places emphasis on independent living and impairment to major life activities. There has also been a growing tendency to define disabilities on a functional level continuum along with developing clearer definitions of the words "handicap," "disability," and "impairment".

Definitions Used in Laws, Regulations, Standards and Resource Papers (see Table 19).

References to handicapped or elderly in early laws in the United States were brief and limited. In 1917 and 1918, Minnesota and Massachusetts passed laws to include vocational rehabilitation for "persons disabled in industry and otherwise." Other early definitions for vocational rehabilitation include:

Skills and actions needed to remove the barriers that separate the disabled person from employment are the skills and actions of vocational rehabilitation.

Rehabilitation may be understood to be that activity that is required to assist an individual to move from a status of inadequacy to a status of adequacy.

Rehabilitation shall be construed to mean the rendering of a disabled person fit to engage in remunerative occupation.

The Rehabilitation Act of 1920 promoted "...vocational rehabilitation of persons disabled in industry and service."

By 1941, vocational rehabilitation became "... the rendering of a disabled individual fit to engage in remunerative occupation and his placement in employment, including, where needed, physical restoration and repair, medical examination and care, prosthetic and other devices, physical and occupational therapy, training, placement in employment and other appropriate services."

By 1943, it was felt that disability was not a handicap to production and employment and that vocational rehabilitation had "...become a rational and cultural-economic necessity in a healthy society."

Table 19: States' Definitions of the Handicapped

	Definition of Handicapped complies with ANSI	Developmental Restrictions (Children, dwarfs, etc.)	Aging	Severe Locomotor impediments using appliances	Severe Locomotor impediments without using prosthetic appliance	Semi-Ambulatory	Non-Ambulatory (Wheelchair)	Disabilities of Incoordination or Body Control (Cerebral Palsy)	Upper Limb Involvement	Obvious Confusion or Disorientation	Sight Disabilities	Hearing Disabilities	Involvement	Comments
Alabama	+		X			X	X	X			X	X	X	
Alaska	XO					X	X	X			X	X	X	
Arizona	X		X			X	X	X			X	X	X	
Arkansas	+#													
California	#													
Colorado	+		X			X	X	X			X	X	X	1975 law
Connecticut	XO													
Delaware	+#													Exec. Order
D.C.														
Florida	X#			X	X	X	X	X			X	X	X	
Georgia	X		X			X	X	X			X	X		
Hawaii	XO													
Idaho	XO										X			
Illinois							X							
Indiana	+O													
Iowa	+O													
Kansas	X#													
Kentucky	O													
Louisiana	XO													
Maine				X	X	X	X	X			X	X		General only
Maryland														
Massachusetts			X	X	X	X	X	X			X	X		
Michigan				X	X	X	X	X			X	X		
Minnesota	X		X	X	X	X	X	X			X	X	X	In spec.
Mississippi	O													
Missouri	O													
Montana	+O													
Nebraska	X		X	X	X	X	X	X			X	X		
Nevada	XO													
New Hampshire	XO													
New Jersey	+#					X	X							Legislation Pending

Table 19: States' Definitions of the Handicapped (continued)

	Definition of Handicapped complies with ANSI	Developmental Restrictions (Children, dwarfs, etc.)	Aging	Severe Locomotor impediments using appliances	Severe Locomotor impediments without using prosthetic appliance	Semi-Ambulatory	Non-Ambulatory (Wheelchair)	Disabilities of Incoordination or Body Control (Cerebral Palsy)	Upper Limb Involvement	Obvious Confusion or Disorientation	Sight Disabilities	Hearing Disabilities	Involvement	Comments
New Mexico	+0													
New York			X	X	X	X	X	X			X	X		
North Carolina	X		X	X	X	X	X	X			X	X		
North Dakota	0													
Ohio		X				X	X	X						Very general
Oklahoma	X#													
Oregon	+0													
Pennsylvania	+0													
Rhode Island	X		X	X	X	X	X	X			X	X	X	
South Carolina	+#													
South Dakota	+#													
Tennessee			X		X	X	X	X			X	X	X	Listed not defined
Texas	X		X	X	X	X	X	X			X	X	X	
Utah	+#		X			X	X	X			X	X		Listed not defined
Vermont	#													
Virginia	+#													
Washington	X#													
West Virginia			X	X	X	X	X				X	X		
Wisconsin	0													
Wyoming	#													

Key: # Definition of terms not given
 0 No definition stated
 + "A Survey of State Legislation to Remove Architectural Barriers"
 President's Committee on Employment of the Handicapped, 1973:
 states that adopted ANSI standards.

By 1948, vocational rehabilitation for civilians included: "All men and women of working age with substantial job handicaps in the form of physical or mental impairments.... The services are not only for those where disabilities are readily seen such as amputees, paraplegics, spastics, and the visually impaired, but also those with unseen handicaps such as tuberculosis, emotional disabilities, arthritis, deafness, and heart disease."

During this same period, the elderly were beginning to receive recognition. The Social Security Act of 1935 included "Old Age Assistance and Old Age Survivor's Insurance."

By 1954, the Vocational Rehabilitation Amendments used the term "physically handicapped individual" to mean "any individual who is under a physical or mental disability which constitutes a substantial handicap to employment, but which is of such a nature that vocational rehabilitation services may reasonably be expected to render him fit to engage in a remunerative occupation."

In 1961, The American National Standard Specifications for Making Buildings and Facilities Accessible to and Usable by the Physically Handicapped had been adopted by the ASA. The definitions section contained very specific references to many types of handicaps not included before, and contained "aging" as one category. The definitions read:

- 2.1 Non-ambulatory Disabilities. Impairments that, regardless of cause or manifestation, for all practical purposes, confine individuals to wheelchairs.
- 2.2 Semi-ambulatory Disabilities. Impairments that cause individuals to walk with difficulty or insecurity. Individuals using braces or crutches, amputees, arthritics, spastics, and those with pulmonary and cardiac ills may be semi-ambulatory.
- 2.3 Sight Disabilities. Total blindness or impairments affecting sight to the extent that the individual functioning in public areas is insecure or exposed to danger.
- 2.4 Hearing Disabilities. Deafness or hearing handicaps that might make an individual insecure in public areas because he is unable to communicate or hear warning signals.
- 2.5 Disabilities of Incoordination. Faulty coordination or palsy from brain, spinal or peripheral nerve injury.
- 2.6 Aging. Those manifestations of the aging process that significantly reduce mobility, flexibility, coordination, and perceptiveness but are not accounted for in the aforementioned categories.
- 2.10 Involved (Involvement). A portion or portions of the human anatomy or physiology, or both, that have a loss or impairment of normal function as a result of genesis, trauma, disease, inflammation or degeneration.

An added description reads: "Note: Disabilities are specific and where the individual has been properly evaluated and properly oriented and where architectural barriers have

been eliminated, a specific disability does not constitute a handicap. It should be emphasized that more and more of those physically disabled are becoming participants, rather than spectators in the fullest meaning of the word."

The Vocational Rehabilitation Act as amended through 1965, Public Law 89-333, states: "The term 'handicapped individual' means any individual who is under a physical or mental disability which constitutes a substantial handicap to employment, but which is of such a nature that vocational rehabilitation services may reasonably be expected to render him fit to engage in gainful occupation ... 'Individual who is under a physical or mental disability' means an individual who has a physical or mental condition which materially limits, contributes to limiting, or, if not corrected, will probably result in limiting his activities or functioning." According to the Fact Sheet⁷⁴ put out by the Department of Health, Education and Welfare soon after passage of the Act, the entire Act "is amended in several places to delete the term 'physically handicapped' and substitute the term 'handicapped.' This is done to simplify terminology and to avoid the inference that the program is not concerned with persons with mental handicaps."

Some states were making great strides in developing criteria. The State University Construction Fund of New York in its widely distributed publication, Making Facilities Accessible to the Physically Handicapped, states that "in planning, two main types of handicapped are to be considered:

- (1) The ambulant and semi-ambulant—including persons with crutches or walking sticks, the visually impaired, individuals with cardiac conditions, and the deaf;
- (2) Paraplegics, amputees and hemiplegics—all of whom are handicapped in the upper or lower extremities to an extent which usually dictates their confinement to a wheelchair."

Massachusetts passed a law in 1968 which stated that the definition of "physically handicapped" used in that legislation is "a person confined to a wheelchair; a person who, because of the use of braces or crutches or because of a loss of a foot or leg or because of an arthritis, spastic, pulmonary or cardiac condition, walks with difficulty or insecurity; a person who, due to a brain, spinal, or peripheral nerve injury, suffers from a faulty coordination or palsy; a person who is blind or whose sight is so impaired that, functioning in a public area, is insecure or exposed to danger; a person whose hearing is so impaired that he is unable to hear warning signals; and a person whose mobility, flexibility, coordination and perceptiveness are significantly reduced by aging."

The "Architectural Barriers Act"⁴³ passed in 1968, states that it is to be concerned with "physically handicapped persons" and the "physically handicapped." However, the Act itself does not define that term.

The Department of Transportation put out a booklet called Travel Barriers⁷⁵ in May of 1970. It was a report summarizing the findings of the Department of Transportation sponsored research program. It stated that handicapped travelers included the aged, those with chronic medical conditions, short-term illness or injury, those who are oversize or undersize, pregnant, blind or with impaired senses, and also those carrying bulky packages or suitcases and children.

In 1971, during the hearings on A Barrier-Free Environment for the Elderly and the Handicapped,⁷⁶ on October 18, 1971, before the Senate Special Subcommittee on Aging, Peter Lassen described handicapped persons as including paraplegics, visually impaired, aged, cardiacs, etc., and also including less obvious groups such as pregnant women, mothers with babies, persons carrying heavy packages, temporary disabilities such as broken bones, invisible disabilities such as respiratory difficulties, etc. He observed that it could be said that handicapped people could include, but not be limited to, people in wheelchairs, visually impaired, amputees, mentally sub-normal and all others and thus not leave anyone out that might have such a classification. During that same hearing, Cecelia O. Neill stated that if the design criteria were based on access of the elderly in wheelchairs, that all other groups would be covered as well. In subsequent legislation and in both the research on "Travel Barriers" and the Hearings by the Special Subcommittee on the Aging, Mrs. Kathaleen Arneson and Dr. William Bean of the Rehabilitation Services Administration provided the basic orientation and historical perspective on federal governmental efforts including barriers as well as definitions.

At about the same time, other definitions were attempted. Public Law 91-230, Title VI as amended, stated that, in education, "'handicapped' refers to mental retardation, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, crippled, or other health-impaired and learning-disabled children, who, by reason thereof, require special education and related services."

Public Law 91-517 states that in the Developmental Disabilities Program "...'developmental disability' refers to a disability attributed to mental retardation, cerebral palsy, epilepsy, or another nervous condition, closely related to mental retardation," which originated before age 19, and can be expected to continue indefinitely and constitute substantial handicap to such individuals.

Social Security programs state that disability refers to an "inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to last for a continuous period of not less than twelve months."

The Urban Mass Transportation Act of 1964, Public Law 91-453, as amended in 1974, defines, "For purposes of this Act, the term 'handicapped person' means any individual who, by reason of illness, injury, age, congenital malfunction, or other permanent or temporary incapacity or disability, is unable without special facilities or special planning or design to utilize mass transportation facilities and services as effectively as persons who are not so affected."

Section 105(b) of the Federal-Aid Highway Act Amendments of 1974, Public Law 93-643⁵⁷ amends the above definition by inserting after "disability" and before "are unable" the words "including those who are non-ambulatory, wheelchair bound and those with semi-ambulatory capabilities," and completes the sentence as "to utilize such facilities and services effectively."

The Rehabilitation Act of 1973, Public Law 93-112,⁴⁸ states that:

- (1) The term "handicapped individual" means any individual who (a) has a physical or mental disability which for such individual constitutes or results in a substantial handicap to employment and (b) can reasonably be expected to benefit in terms of employability from vocational rehabilitation services provided pursuant to Titles I and III of this Act.
- (2) The term "severely handicapped" means the disability which requires multiple services over an extended period of time and results from amputation, blindness, cancer, cerebral palsy, cystic fibrosis, deafness, heart disease, hemiplegia, mental retardation, mental illness, multiple sclerosis, muscular dystrophy, neurological disorders (including stroke and epilepsy) paraplegia, quadriplegia and other spinal cord conditions, renal failure, respiratory or pulmonary dysfunction, and any other disability specified by the Secretary in regulations he shall prescribe.

Thus, the Act requires that the Department of Health, Education and Welfare and State Vocational rehabilitation agencies provide services on a priority basis to "those with the most severe handicaps, so that they may prepare for and engage in gainful employment."

The basic condition of eligibility according to the manual of politics, Georgia Division of Vocational Rehabilitation Service, March, 1974, shall be based upon:

- (1) The presence of a physical and/or mental impairment;
- (2) The existence of a substantial handicap to employment (a physical or mental disability) which in the light of attendant medical, psychological, vocational, educational, cultural, social or environmental factors impedes an individual's occupational performance by preventing his obtaining, retaining or preparing for a gainful occupation consistent with his capacities and abilities;
- (3) A reasonable expectation that vocational rehabilitation services will render the individual fit to engage in a gainful occupation (including employment in a competitive labor market; practice of a profession; self-employment; farm or family, including work for which payments are in kind rather than in cash; sheltered employment; and home industries or other gainful homebound work).

Perhaps the most significant change in definition is the change of title from the Vocational Rehabilitation Act to the Rehabilitation Act.

Section 111(a) of the Rehabilitation Act Amendments of 1974⁵⁰ contains a new definition of a handicapped individual for use with Titles IV and V. These titles concern the responsibilities of the Secretary (Office for Handicapped Individuals) and Title V (Architectural Barriers, Employment of the Handicapped in Government, and Affirmative Action Employment Plan). The new definition is as follows: "Any person who (a) has a physical or mental impairment which substantially limits one or more of such person's major life activities; (b) has a record of such impairment, or (c) is regarded as

having such impairment." The definition of a handicapped individual as related to the provision of vocational rehabilitation services has not changed.

The Rehabilitation Comprehensive Services and Developmental Disabilities Amendments of 1978 adds the following definition under Title V:

"The term 'developmental disability' means a severe, chronic disability of a person which:

(A) is attributable to a mental or physical impairment or combination of mental and physical impairments;

(B) is manifested before the person attains age twenty-two;

(C) is likely to continue indefinitely;

(D) results in substantial functional limitations in three or more of the following areas of major life activity: (i) self-care, (ii) receptive and expressive language, (iii) learning, (iv) mobility, (v) self-direction, (vi) capacity for independent living, and (vii) economic self-sufficiency; and

(E) reflects the person's need for a combination and sequence of special, interdisciplinary, or generic care, treatment, or other services which are of lifelong or extended duration and are individually planned and coordinated."

Under Title VII, services may be provided to individuals with impairment so severe as to require appreciably more costly rehabilitation services than are normally required in order to improve significantly the ability to be employed or to function independently in the family or community.

The Housing and Community Development Act of 1974⁶⁴ broadens the definition of the term "handicapped" to cover specifically the mentally and physically handicapped, including the developmentally disabled. Community development programs to be assisted by the funds provided under this Act included special projects to remove material and architectural barriers which restrict mobility and accessibility of elderly and handicapped persons.

The Department of Health, Education and Welfare Regulations of 1974 add "Temporary disabilities due to broken limbs, sprains, illness, pregnancy, etc." "Mental retardation" is mentioned as a group in which many would have physical disabilities that might benefit from "barrier-free design."

In 1961, the first White House Conference on Aging was held. In response, The Older American Act of 1965 established the Administration on Aging. In 1971, the Second White House Conference on Aging was held. In the first report of this Conference, those 55 and over, even though disabled, were felt to be contributors, if suitably rehabilitated and provided employment opportunities. In one place in the report, aged were described as over 75.

The Older Americans Act of 1965 provided the most concrete incentive for concerted federal and state programs to remedy the problems of the aged, including "...the best possible physical and mental health; suitable housing; full restorative service...."

The Social Security Amendments that same year established Medicare.

The Older Americans Act of 1965 as Amended in 1973, Public Law 93-29,⁶¹ made reference to adapting housing to older persons suffering from physical disabilities; providing services to assist in meeting particular needs of physically and mentally impaired older persons, to assist them to lead more independent lives; and provision of multipurpose senior centers constructed in compliance with the "Architectural Barriers Law."

The Urban Mass Transportation Act of 1964, as amended defines a handicapped person as "any individual who by reason of illness, injury, age, congenital malfunction or other impairment or temporary incapacity or disability..." is unable to fully utilize services. A similar definition is found in the Federal Aid Highway Act of 1973, as amended.

The regulations under Section 503 and Section 504 of the Rehabilitation Act of 1973 reference the need to remove barriers to provide reasonable accommodation to the needs of disabled people for an accessible and usable environment in which to study, work, play and generally live productive lives.

The White House Conference on Handicapped Individuals of 1977 studied definitions along with many other problems facing this group. Their definitions will have an impact on many problems facing handicapped individuals and clarification of terms is sure to be among them.

Currently, there is a growing tendency to define disabilities on a functional continuum along with developing clearer definitions of the words "handicap", "disability", and "impairment".

summary, conclusions, and recommendations

Federal Laws. Many laws directed at helping elderly and handicapped people have been passed in this century. The most active period has been during the past two decades. Since the acceptance of the American National Standards Institute Standard Specifications in 1961, several significant laws have contained reference to the needs and rights of elderly and handicapped citizens. Such laws include the Vocational Rehabilitation Act Amendments of 1965, the "Architectural Barriers Act" of 1968 as amended, the Urban Mass Transportation Assistance Act of 1964 as amended, the Federal-Aid Highway Act of 1973 as amended, the Rehabilitation Act of 1973, as amended, the Tax Reform Act of 1976, and to a certain extent, the Older Americans Act of 1965 as amended. The need now is to coordinate the implementation of these statutes.

Early in this century, as befitted the work ethic of our society, only those physically handicapped individuals who were potentially employable were considered as needing

special care. In the 1940's and 1950's, it was not only an "economic necessity" but "rational" in a "healthy society to rehabilitate the handicapped for employment." Later, mental impairments along with "unseen handicaps" became a concern. By 1961 the ANSI Standard Specifications contained specific reference to non-ambulatory, semi-ambulatory, sight, hearing, incoordination disabilities and aging. More and more, "disability" was thought of as the impairment, and "handicap" as the inability to do certain things because of the effect of the impairment. Later the word "physically" was dropped as a modifier to "handicapped" and "vocational" was dropped from "rehabilitation."

Most recently, temporary disabilities and oversize and undersize were added to the longer lists found in various laws and statements of specific disabilities that had taken the place of generic term "handicaps." By 1974, Federal Law included any person "who has a physical or mental impairment which substantially limits one or more of such person's major life activities." Thus, the emphasis included not only economics but social mainstreaming. The preceding definitions are appropriate but not without ambiguity and confusion and are in need of clarification and coordination.

As stated in the Congressional Record, No. 107, Vol. 120, July 18, 1974,⁷⁸ the Subcommittee on the Handicapped, during consideration of the Rehabilitation Act of 1973, found that compliance with the major Federal law on the subject of architectural barriers (Public Law 90-480) had faltered because of unclear compliance procedures and administration responsibility. The Rehabilitation Act Amendments of 1974 improved this situation somewhat, and only after a period of appropriate application will it be known if improvement is adequate.

One of the most important areas in which change is needed is in Federal Regulations. Most major Federal regulations reflect the essence of the American National Standards Institute Standard Specifications, with some additions or exceptions in some areas. The American National Standards Institute Standard Specifications are being updated and expanded in scope to cover more categories more completely. Such revision is badly needed.

In looking through the supplemental regulations or standard for each federal department, it is apparent that there has been an attempt to augment or modify the American National Standards Institute Standard Specifications to meet specific needs. The best known attempt is the Federal Property Management Regulations (FPMR).⁴² Many of these additional standards are not clearly delineated or defined and often are not printed in one place in the regulations. Also, each department has individual problems to solve, many of them "new" and untested. Few of the regulations and standards include statements concerning handicapped and elderly pedestrians. Regulations involving streets, sidewalks, bus stops, and so forth are poor or lacking.

As a rule, regulations do not give proper reference to all other applicable standards or regulations. Often, too, it is difficult to find the appropriate person or office responsible for developing the standards and/or the office from which to gather the information.

Until recently the standards and regulations have not been effective in eliminating architectural barriers as well as might have been expected considering the laws passed. In addition, agencies have not been cooperating well enough to eliminate duplication, overlapping, and apparent non-compliance. It would seem that greater priority for such activity would bring greater results. The passage of Section 504 should result in reducing the deficiencies.

Some form of organization of standards should be sought with a central source created for compliance and updating. No one rule or standard will apply to all circumstances, so interagency cooperation, communication and education need to be increased.

The Architectural and Transportation Barriers Compliance Board, made up of the nine major federal agencies involved in the area, may be a good organization to unify all efforts and thereby make possible the creation of standard specifications with supplements to meet specific needs. Adequate enforcement powers will be needed to coordinate regulations between departments.

Codes. A July, 1974 study done by the Atlanta Regional Commission (ARC) on Construction Codes in the Atlanta Area, A Survey of Current Practices stated that those interviewed felt that adoption of uniform construction codes brought trust between the community, builders and buyer; reduction in building costs; acceptance of new materials and techniques for construction; and improvement of the community's environment. The Commission recommends a regional training Center for Inspectors and adoption of a national or state model code for those communities that do not have codes, or that communities should contract such service with their county government. The Commission further recommends that a comprehensive code enforcement program should be one objective of every government.

The Commission's report was deficient in that it did not include recommendations on the removal of architectural barriers standards. It would seem that this trust in the codes and what they can do should be carried one step further. Architectural barriers standards should be added to all of the codes, and clearly identified as such, so that they may be incorporated in spirit and in fact. Education must go hand-in-hand with the use of any such new code provisions.

State Laws. Fifty states now appear to have some form of architectural barriers law. A survey of state architectural barriers laws showed that nearly all follow American National Standards Institute Standard Specifications in part or in toto (see Table 17). Most do not seem to have real "teeth" in their enforcement; only six have sanctions in the form of misdemeanors. Few of the state laws cross-reference the codes/standards used or recommended except in the case of the American National Standards Institute Standard Specifications. As with Federal regulations, these laws often do not encompass streets, crosswalks, intersections or sidewalks, nor were these found under traffic or motor vehicle regulations in six sample states checked. State laws also often do not include special facilities such as stations, terminals, bus stops, etc.

Many statutes and regulations are so vague as to be difficult to follow and, as there are few states which demand compliance, there is little incentive to comply. The scope of

the laws is limited, for the most part, to public buildings only. Definitions of handicapped people are vague or not inclusive enough to reach most categories, and definitions of buildings and facilities are often not given. Very few require that the access symbol be displayed. All those loopholes should be remedied.

Since all past references to the American National Standards Institute Standard Specifications refer to the A117.1-1961 document, and since the newly proposed standards are more all-encompassing, it may be that there will be problems in achieving full adoption by Federal agencies in a reasonable time. States will have to amend old laws to include the new standards when they are adopted.

There are many obstacles from the time a state (or Federal) bill is introduced until it is passed. The success in the states shows what can be accomplished with concerned effort and what must be done again to improve state laws. Several states have recently passed more appropriate laws and one state now has a compliance board.

Improved laws and regulations, coupled with the education of those who will carry out the laws (state and local officials, architects, contractors, code officials) will result in improved service to handicapped and elderly people.

summary of recommendations

Consistency in Federal laws through coordination of writing and implementation of regulations in both requirements and definitions should be a primary goal. The best of the state laws should be used as models to develop more consistent and unified requirements for state laws. Codes should be studied by individuals and agencies using them and by the coding agencies to best utilize available expertise and to encourage consistency in these documents and their application. Laws must be enforced consistently, but interpretations should be flexible. Applications of the regulations should be made by knowledgeable people who can assess how to best solve individual problems in a broad range of settings and situations. Most important, attitudinal barriers should be broken down through education and just application of all laws, regulations and codes.

Some specific recommendations follow.

1. Greater compliance with the "Architectural Barriers Act of 1968" as amended and the Rehabilitation Act of 1973 as amended and other appropriate laws through:
 - a. Closing loopholes discovered in the laws when implementation is attempted.
 - b. Increased reporting to responsible agencies as well as Congress.
 - c. Providing appropriate funding and support for the Architectural and Transportation Barriers Compliance Board to unify and coordinate efforts and for compliance surveys as ascertained from the Board staff.
 - d. Instituting stronger sanctions for non-compliance with the laws as needed.

- e. Educating of lawmakers as to how to construct appropriate legislation. To meet needs of the handicapped by handicapped consumers and providers.
 - f. Consistent application of laws through regulations.
2. Encouragement of cooperation between states to coordinate their laws based on model laws and regulations to provide for greater consistency and cost effectiveness.
 3. Improvement in regulations and code and design standards through:
 - a. Periodic and regular updating of the basic American National Standard Specifications for making buildings and facilities accessible to, and usable by, the physically handicapped, 117.1 - 1961, R. 1971 (now underway) and their subsequent inclusion and enforcement.
 - b. Updating the supplemental standards, based on the new ANSI Standards.
 - c. Improving identification, codification and cross-referencing of all standards and regulations with clear reference as to what regulations and standards apply and where to find them.
 - d. Removing ambiguity, confusion, and vagueness of regulations and standards.
 - e. Aiding states to enact appropriate laws and regulations based on good model laws, such as the North Carolina Code, and the revised ANSI Standard No. 117.1.
 - f. Cooperation between those who are attempting to update standards and codes on all levels (i.e., Department HEW, ANSI, DOT-FH-11-8504, Illinois, North Carolina).
 - g. Backing efforts of expert private groups that seek constructive change, (i.e., National Center for a Barrier-Free Environment, designers, and professionals in rehabilitation).
 - h. Increasing educational efforts, including funding to support such efforts, for those using the standards and regulations.
 4. Improvement of definitions by:
 - a. Updating the basic American National Standards Institute definitions (now being done).
 - b. Updating and coordinating supplemental definitions to meet specific needs.
 - c. Using functional rather than catagorical definitions.
 - d. Clarifying the terms: "impairment," "disability", "handicap".

- e. Updating of information and education and materials as a continuous, dynamic process to stay in line with needs and to sensitize new generations of people dealing with this process.
- 5. Encouraging planning for retrofitting an existing environment to make it accessible through legislation and funding.
- 6. Special efforts to make accessible streets, sidewalks, parks, public spaces and other facilities controlled by cities and local authorities through inclusion in laws and standards (which this present research is addressing).
- 7. Funding research for improvements in barrier-free design.

references

1. Accident Facts, National Safety Council, Chicago, Illinois, 1974.
2. Roed, O.J., "San Diego's Senior Citizen Pedestrian Safety Program," Traffic Digest and Review, Northwestern University Traffic Institute, August, 1971, pp. 14-15.
3. Baker, S.P., Robertson, L.S., and O'Neill, B., "Fatal Pedestrian Collisions; Driver Negligence," American Journal of Public Health, April, 1974, pp. 318-325.
4. Hurley, J.L. & Thompson, R.L., Model Programs in Pedestrian and Bicycle Safety for Wisconsin Communities, University of Wisconsin, Whitewater, Department of Safety Education, January, 1973.
5. Jones, T.O., Repa, B.S., and Potgiesser, J.L., "A General Overview of Pedestrian Accidents and Protection Countermeasures," Proceedings, Third International Congress on Automotive Safety, Volume I, 1974.
6. Kuzimoko, L., Pedestrian Accident Study, New York State Department of Motor Vehicles, August, 1971.
7. Mackie, A.M. & Older, S.J., "Study of Pedestrian Risk in Crossing Busy Roads in London Inner Suburbs," Traffic Engineering and Control, October, 1965, pp. 376-379.
8. Pedestrian Protection, (A pamphlet), published by the Division of Highway Safety, Officer of the Governor, State of Wisconsin, 1974.
9. Roberts, Diane C., "Pedestrian Needs: Insights from a Pilot Survey of Blind and Deaf Individuals," Highway Research Record, Number 403, Highway Research Board, 1972, pp. 51-52.
10. Wiener, Earl L., Elderly Pedestrians and Drivers: The Problem that Refuses to Go Away, Miami University, Florida, 1972.
11. Blackman, Allan, The Role of City Planning in Child Pedestrian Safety, Center for Planning and Research Development, July, 1966.
12. Marsden, William E., Jr., A Decade of Pedestrians and their Traffic Collisions (1963-1972), California State University, San Diego, August, 1973.
13. Tharp, K.J., Multi disciplinary Accident Investigation—Pedestrian Involvement, Final Report, National Highway Traffic Safety Administration, June 1974.
14. Fruin, John J., "Pedways versus Highways: The Pedestrian's Right to Urban Space," Highway Research Record, Number 406, Highway Research Board, 1972, pp. 28-36.

15. American Automobile Association: "The Young Pedestrian," Pedestrian Safety Program Series, Number 3, 1965, as cited in Jones, Repa, & Potgiesser, "A General Overview of Pedestrian Accidents and Protection Countermeasures," Proceedings, Third International Congress on Automobile Safety, Volume I, 1974.
16. Marks, Harold, "Child Pedestrian Safety: A Realistic Approach," Traffic Engineering, October, 1957.
17. Carp, Francis M., "Pedestrian Transportation for Retired People," Highway Research Record, Number 356, Highway Research Board, 1971, pp. 105-118.
18. Lashley, Glen T., "The Aging Pedestrian," Traffic Safety, National Safety Council, August, 1960, pp. 18-19.
19. Libow, Leslie S., "Older People's Medical and Physiological Characteristics: Some Implications for Transportation," Transportation and Aging, Selected Issues, edited by J. Cantilli and June L. Shmelzer, U.S. Government Printing Office, 1970.
20. "The Senior Citizen in Traffic," Traffic Safety, National Safety Council, August, 1960, pp. 18-19.
21. Herms, Bruce F., Pedestrian Crosswalk Study, City of San Diego, California, 1970, as cited in Marsden, A Decade of Pedestrians and Their Traffic Collisions (1963-1972), California State University, San Diego, August, 1973.
22. Bruce, John, "One-Way Major Arterial Streets," Highway Research Board Special Report, Number 93, 1967.
23. Fruin, John J., Pedestrian Planning and Design, Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971.
24. Marsden, William E., Jr., Alcohol and Pedestrian Fatalities: A Study of Fatal Pedestrian Collisions in San Diego County, San Diego County, California, Engineering Department, 1972.
25. Templer, J.A., Stair Slope and Human Movement, (unpublished doctoral dissertation), Columbia University, New York, 1974.
26. "Use of Special Aids" Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 78, 1969.
27. U.S. Summary: General Population Characteristics, Vol. 1, Pt. 1, Tables 50, 52 and 53, U.S. Census, Washington, D.C., 1970.
28. Vital and Health Statistics, DHEW Washington, D.C., Series 10, No. 78, 1969.
29. "Impairments Due to Injury," Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 87, 1971.

30. National Institute of Mental Health, Patients in Mental Institutions, II, 1964.
31. Department of Health, Education and Welfare, Series 10, No. 46, "Characteristics of Visually Impaired Persons," U.S., July 1963-June 1964, Vital Health Statistics, National Center for Health Statistics.
32. Hatfield, E.M., "Estimates of Blindness in the United States," The Sight-Saving Review, Vol. 43, No. 2, pp. 69-80, 1973.
33. National Society for the Prevention of Blindness, Inc., Unpublished Report, January 1975.
34. Mudford, H.A., "Drinking and Deviant Drinking, U.S.A., 1963," Quarterly Journal of Studies on Alcohol, Vol. 25, 1964.
35. Eddy, Nathan; H. Halback: Ing. Harris Isbel and Maurice H. Seevers, Drug Dependence: Its Significance and Characteristics, Bulletin, WHO, Vol. 32, 1965.
36. Martindale, Don and Edith Martindale, The Social Dimensions of Mental Illness, Alcoholism and Drug Dependence, Glenwood Publishing Co., 1973.
37. U.S. Bureau of Census, Current Population Report Series P25, No. 311, 483 & 493.
38. American National Standards Institute.
39. American National Standards Institute, Inc., American National Standards Specifications for Making Buildings and Facilities Accessible to and Usable by the Physically Handicapped, A117.1, New York, ANSI, 1961.
40. Nugent, Timothy J., "Design of Buildings to Permit Their Use by the Physically Handicapped," New Building Research, Fall, 1960, Publication 910, Buildings Research Institute, National Academy of Science.
41. Legislative Mandate of the Architectural and Transportation Barriers Compliance Board, 1977.
42. General Services Administration, Federal Property Management Regulations, Subpart 101-19.6, "Accommodations for the Physically Handicapped."
43. "Architectural Barriers Act," P.L. 90-480, An Act to Ensure that Certain Buildings Financed with Federal Funds are so Designed and Constructed as to be Accessible to the Physically Handicapped, 1968.
44. "Design and Construction of Federal Facilities to be Accessible to the Physically Handicapped," Hearings before the Subcommittee on Public Buildings and Grounds of the Committee on Public Works, House of Representatives, 91st Congress, 1st Session on H.R. 14464, December 9, 1969.
45. Washington Metropolitan Area Transit, P.L. 91-205, March 5, 1970.

46. Amendments to Architectural Barriers Act, P.L. 90-541, October 18, 1976.
47. First Report of the Architectural and Transportation Barriers Compliance Board to the Congress of the United States, November, 1974.
48. Rehabilitation Act of 1973, P.L. 93-112.
49. Affirmative Action, A Resource Manual For Vocational Rehabilitation, Third Institute on Rehabilitation Issues, Figure 1, June 1-3, 1976, Dallas, Texas. (See Table 16).
50. Rehabilitation Act Amendments of 1974, P.L. 93-516.
51. 1977 White House Conference on Handicapped Individuals, Vol. I, II, III, 1978.
52. Rehabilitation, Comprehensive Services, and Developmental Disabilities Amendments of 1978, P.L. 95-602 (HR-12467).
53. Executive Order 11914, issued by President Gerald Ford, April 28, 1976.
54. Final Rule, General Services Administration, April 19, 1978.
55. Tax Reform Act of 1976, Tax Reduction for Removal of Architectural and Transportation Barriers, P.L. 94-455.
56. Urban Mass Transportation Assistance Act of 1964 as Amended in 1970, P.L. 91-453.
57. Federal-Aid Highway Act of 1973, P.L. 93-87.
58. Federal-Aid Highway Act Amendments of 1974, P.L. 93-643.
59. Department of Transportation and Rehabilitation Agencies Appropriation Act of 1975, P.L. 93-391.
60. Urban Mass Transportation Act of 1964 as Amended by The National Mass Transportation Act of 1974, Public Law 93-503, Section 5(M).
61. Older Americans Act of 1965 as Amended in 1973, P.L. 93-29.
62. Older Americans Act of 1965 as Amended in 1974, P.L. 93-351.
63. The Housing and Community Development Act of 1964, P.L. 88-560.
64. The Housing and Community Development Act of 1974, P.L. 93-383.
65. HEW News, Statement by Joseph A. Califano, Jr., Sec., April 28, 1977.

66. Department of Health, Education and Welfare, Technical Handbook for Facilities, Engineering & Construction Manual, Part 4, Facilities and Construction 4.00, Architectural Section 4.12, "Design of Barrier-Free Facilities," September, 1975.
67. Department of Defense, Department of the Army, Design for the Physically Handicapped, EM1110-103, October 15, 1976.
68. Office of Public Affairs, "Transbus Features," UMTA, 1977, News, May 19, 1977.
69. "Transportation of the Elderly and Handicapped," Technology Sharing, January, 1977.
70. National Highway Traffic Safety Administration, Tips on Cars and Safety for Deaf Drivers, July, 1975.
71. Federal Aviation Administration, "Air Transportation of Handicapped Persons," Advisory Circular, AC 120-32, March 25, 1977.
72. Committee on Barrier-Free Design: The President's Committee on Employment of the Handicapped, A Survey of State Legislation to Remove Architectural Barriers, Washington, 1973.
73. Mace, Ronald L., and Laslett, Betsy, Eds., An Illustrated Handbook of the Handicapped Section of the North Carolina State Building Code, 1974.
74. Vocational Rehabilitation Administration, Fact Sheet on the Vocational Rehabilitation Act Amendments of 1965, P.L. 89-333, Washington, D.C.
75. "Travel Barriers," Office of the Secretary, May, 1970.
76. "A Barrier Free Environment for the Elderly and the Handicapped," Hearings before the Special Committee on Aging, U.S. Senate, 92nd Congress, First Session, Parts 2 and 3, October 19-20, 1971.
77. Freedom of Choice, Report to the President and to The Congress on "Housing Needs of Handicapped Individuals," Washington, D.C., October, 1975.
78. "Accessibility, the Law and Reality," 93rd Congress, 2nd Session, Senate, 120: No. 107, Washington, D.C., July 18, 1974.
79. U.S. Summary: General Population Characteristics, Vol. 1, Pt. 1, Table 56, p. 282.
80. U.S. Summary: General Population Characteristics, Vol. 1, Pt. 1, Table 52, p. 269-274.
81. "Characteristics of Persons with Impaired Hearing," Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 35, U.S., July 1962-June 1963.

82. Cisin, I.H., Paper presented before American Association for the Advancement of Science on the Characteristics of Drinkers, December, 1966.
83. Efron, V., and M. Keller, Selected Statistical Tables on the Consumption of Alcohol, 1850-1962, New Brunswick, N.J., Rutgers Center of Alcohol Studies, 1963.
84. Giese, Donald J., Report on Drinking, St. Paul Pioneer Press, May 25, 1969.
85. Jellinek, E.M., The Disease Concept of Alcoholism, Hillhouse Press, 1960.
86. Luria, Donald B., The Drug Scene, McGraw Hill.
87. Alcoholism, 1930-1960, New Brunswick, N.J., Rutgers Center of Alcohol Studies, 1969.
88. Szasz, Thomas S., The Myth of Mental Illness: Foundations of a Theory of Personal Conduct, Harper and Row.

Additional References to Part 3

Articles

Council of State Governments, Architectural Barriers, Suggested State Legislation, 1965.

Dantona, Robert and Tessler, Benjamin, "Architectural Barriers for the Handicapped: A Survey of the Law in the United States," Reprint from Rehabilitation Literature, 28: (February, 1967), 34-43.

Fearn, Donald E., "Easier Entrance and Safer Use: Two Hospital Design Goals," Distributed as a reprint by the National Society for Crippled Children and Adults, Hospitals, 40, February 1, 1966.

Finley, F., Ray and Cody, Kevin A., "Locomotive Characteristics of Urban Pedestrians," Archives of Physical Medicine and Rehabilitation, July, 1970.

Jacobs, Eveline E., "Don't Let the Building Keep Them Away," International Journal of Religious Education.

Jarler, Mildred, "Breaking those Barriers Down," Reprint, The Royer Forum, Spring, 1974.

Jeffrey, Dorothy, "A Living Environment for the Physically Disabled," Reprint, Rehabilitation Literature, 34 (April, 1973), 90-103.

Hillcary, James F., "Buildings for All to Use," Reprint, AIA Journal, March 1969.

Laski, Frank, "Civil Rights Victories for the Handicapped I", The Record.

Latz, William F., "Let's Stop Constructing Inaccessible Buildings," Reprint, The Constructor, May, 1962.

Mitra, S., "Some Disability Statistics of the United States Population," Paper prepared for Department of Transportation Contract No. DOT-FH-11-8504, "Provisions for Elderly and Handicapped Pedestrians," 1975.

Palmer, J.D., Keith, M.D., Lynch, Robert J., and Tessler, Benjamin, "Architectural Barriers Legislation: An Assistive Device on a Large Scale," Southern Medicine (October, 1974), 22-27.

President's Committee on Employment of the Handicapped and the National Society for Crippled Children and Adults, "Architectural Barriers and the Handicapped."

President's Committee on Employment of the Handicapped, "Man-Made Barriers Limit the Mobility of the Handicapped," Reprint, Journal of American Insurance, Spring, 1974.

Rehabilitation Council, United Comm. Services, Board of Directors, Boston, Mass., "Architectural Barriers," January 21, 1966.

"Rehabilitation Act of 1973, P.L. 92-112," Rehabilitation Gazette, 17, 1974.

Washington/Alaska Regional Medical Program, "Barrier-Free Design for the Disabled."

Williams, Lawrence, A., "Only a Step Away," Nation's Cities, February, 1968, p. 21.

Atlanta Regional Commission, "Construction Codes in the Atlanta Metropolitan Area, A Survey of Current Practices," July, 1974.

Committee on Barrier-Free Design, Newsletter, No. 27, March, 1975.

The Council of State Governments, On Growing Old (Study on Aging), Lexington, Kentucky, 1973.

Kliment, Stephen A., The American Institute of Architects, The Rehabilitation Services Administration of HEW, Into the Mainstream: A Syllabus for a Barrier-Free Environment.

Iowa Chapter AIA, Easter Seal Society for Crippled Children and Adults of Iowa, Iowa's Governor's Committee on Employment of the Handicapped, Accessibility, The Law and Reality: A Survey to Test the Application and Effectiveness of Public Law 90-480 in Iowa, 1974.

National Center for Law and the Handicapped, Inc., "Recent Legislation," Newsline, October, 1974; "New decisions," Vol. 2, September, 1974; and "New Florida Legislation," Vol. 2, August, 1974.

The President's Committee on Employment of the Handicapped and the Easter Seal Society, "People Are Asking For and Displaying the Symbol of Access."

State University Construction Fund, Making Facilities Accessible to the Physically Handicapped, Albany, New York, July, 1967.

Cotter, S.R., Degraff, A.H., State University Construction Fund, Architectural Accessibility for the Disabled of College Campuses, Albany, New York, July, 1967.

The White House Conference on Handicapped Individuals, Awareness Papers, Vol. 1, Washington, D.C., May 23-27, 1977.

Barrier Free Design for the Elderly and Disabled, Syracuse University, 1976.

Curtiss, Frances A., & Fowler, Beth, Ph.D., "Barrier-Free Design, A Way of Independent Living," Proceedings of the World Confederation of Physical Therapy, June 19, 1974.

Some Significant Regulations

American National Standards Institute, Inc., American National Standards Specifications for Making Buildings and Facilities Accessible To, and Usable By, the Physically Handicapped, A117.1, New York, ANSI, 1961.

Department of Housing and Urban Development, Low-Rent Housing Preconstruction Handbook, Chapter 3, (7410.1) Section 1, "Criteria," Sub-Section 3-7b.2, January, 1974.

Department of Defense, Department of Defense Construction Criteria Manual, Instr. 4270.1-M, Section 5-1.6, "Provisions for Physically Handicapped."

Department of Transportation, Federal Regulations, "Codification of Requirements of Elderly and Handicapped Transportation Services," February 26, 1975.

U.S. Postal Service, Design Guidelines for Postal Facilities, Washington, D.C., June, 1974 (revised November, 1974).

"Accessibility of Public Buildings to the Physically Handicapped," Hearing before the Subcommittee on Public Buildings and Grounds of the Committee of Public Works, U.S. Senate, 90th Congress, 1st Session, July 17, 1967.

"Usefulness of the Model Cities Program to the Elderly," Hearings before the Special Committee on Aging, U.S. Senate, 91st congress, 1st Session, Part 7, October 14-15, 1975.

"Transportation and the Elderly: Problems and Progress," Hearings before the Special Committee on Aging, U.S. Senate, 93rd Congress, 2nd Session, Parts 1 and 2, February 25, 28, 1974.

"Vocational Rehabilitation Services: Oversight Hearings," Select Subcommittee on Education of the Committee on Education and Labor, House of Representatives, 93rd Congress, 1st Session, Part 2, November 30 and December 10, 1973.

Proceedings, Reports, Position Papers

Proceedings of the National Institute on Making Buildings and Facilities Accessible To and Usable By the Physically Handicapped, November 21-24, 1964, A National Institute on Architectural Barriers sponsored by the National Society for Crippled Children and Adults and financed by the Vocational Rehabilitation Administration.

Fregger, Stephan, "The Elderly Pedestrian," Florida Department of Transportation, August, 1974.

Surveys

Dantona, Robert and Tessler, Benjamin, "Architectural Barriers for the Handicapped: A Survey of the Law in the United States," Reprint, Rehabilitation Literature, 28: 34-43, February, 1967.

Department of Urban Studies, National League of Cities, State and Local Efforts to Eliminate Architectural Barriers to the Handicapped, November, 1967.

U.S. Publications Congressional Record

"National Health Priorities," House, December 10, 1974,

"Standards for Making Buildings Usable by the Physically Handicapped," 87th Congress, 2nd Session, Washington, D.C., 1962.

General Services Administration

"Architectural Criteria," U.S. Government Manual, 1974-75, Office of Federal Register, National Archives and Records Service.

"Criteria for a Federal Office Building," Washington, D.C., November 3, 1971.

Public Buildings Service, Day on Wheels, Washington, D.C., January, 1975.

Department of Health, Education and Welfare

Vocational Rehabilitation Administration, "Help for the Disabled through Vocational Rehabilitation," January, 1963.

Memorandum from Director of Policy Research and Legislation to the Commissioner, Office of Human Development, Rehabilitation Services Administration, March 5, 1975, RE: Recent Developments in Housing for the Handicapped.

"Regulations Governing the Programs Administered by the Vocational Rehabilitation Administration," August, 1967.

Baker, M., Fischetti, M., Williams, L., Young, E., Final Report State and Local Efforts to Eliminate Architectural Barriers to the Handicapped, National League of Cities.

"A Summary of Selected Legislation Relating to the Handicapped, 1963-67," May, 1968.

"A Summary of Selected Legislation Relating to the Handicapped, 1971," 1972, 1974, 1975-76.

"Affirmative Action Plan for Employment of Handicapped Individuals and Disabled Veterans," PHS, 1976.

The Vocational Rehabilitation Act Amendment of 1965, Public Law 89-333, Fact Sheet, 1965.

"Office of Handicapped Individuals," A Descriptive Pamphlet, HEW 391.

Programs for the Handicapped, Office of Handicapped Individuals, May 20, 1977.

U.S. Department of Transportation

"Planning and Designing," Chapter 3, 1974.

HUD Programs That Can Help the Handicapped, Washington, D.C., May, 1977.

U.S. Postal Service

Design Guidelines for Postal Facilities, June, 1974, (revised November, 1974).

U.S. Department of Transportation

Urban Mass Transportation Administration, "Elderly and Handicapped Transportation Services, Federal Register," February 26, 1975, 40.

Federal Highway Administration, Federal-Aid Highway Program Manual, May 27, 1975.

UMTA Office of Public Affairs, "Summary of Urban Mass Transportation Activities to Improve Transportation for Elderly and Handicapped Persons," Washington, D.C., January, 1977.

Architectural and Transportation Barriers
Compliance Board

"Architectural and Transportation Barriers Compliance Board," 8, 76.

"Access America: The Architectural Barriers Act and You," 1976.

"Access Travel: A Guide to Accessibility of Airport Terminals," 1977.

U.S. Conferences

1971 White House Conference on Aging, a Report to the Delegates from the
Conference Sections and Special Concerns Session, November 28-December 2,
1971.

1971 White House Conference on Aging, Toward a National Policy on Aging, Final
Report, Vols. 1 and 2, 1972.

PROCEDURAL FORMS HANDEPED PROJECT

Checkoff Form for Survey of Police Files

1. Victim's name: _____ Code Number _____
2. Date of Accident: _____
3. Day of Week: Sun. Mon. Tues. Wed. Thurs. Fri. Sat.
4. Hour: _____ AM PM
5. Number and Street where accident occurred: _____
6. Intersecting Street (if any): _____
7. Victim's Sex: M F Age: _____ Address: _____
- Injury Code: 1 2 3 4 5
8. Road Defects
 1. () None
 2. () Holes, ruts, bumps
 3. () Under construction
 4. () Slippery
 5. () _____
9. Traffic Control
 1. () Marked traffic lanes
 2. () Stop & Go signal
 3. () Stop & Yield Sign
 4. () Other warning sign
 5. () _____
 6. () No control present
10. Light Conditions
 1. () Daylight
 2. () Dusk
 3. () Dawn
 4. () Darkness, street lighted
 5. () Darkness, street not lighted
11. Road Type
 1. () 1 Lane
 2. () 2 lanes
 3. () 3 lanes
 4. () 4 or more lanes
 5. () Divided or one way
 6. () Freeway, Parkway
 7. () Unpaved

12. Road Character

- 1. () Straight road
- 2. () Curve
- 3. () Level
- 4. () On grade
- 5. () Hill crest

13. Pedestrian Action: Going: N S E W

Along or across _____ from _____ to _____

- 1. () Crossing at intersection with signal
- 2. () Crossing at intersection against signal
- 3. () Crossing at intersection, no signal
- 4. () Crossing at intersection, diagonally
- 5. () Crossing between intersections
- 6. () Walking in roadway with traffic
- 7. () Walking in roadway against traffic
- 8. () Pushing or working on vehicle
- 9. () Other working in roadway
- 10. () Playing in roadway
- 11. () Lying in roadway
- 12. () Standing in roadway
- 13. () Standing off roadway
- 14. () Crossing from behind vehicle
- 15. () Entering vehicle
- 16. () Exiting vehicle

14. Diagram:

15. Any other information:

HOSP.

HANDEPED STUDY

F I

REPORT NO.

GUIDELINES FOR TELEPHONE INTERVIEWS
WITH PEDESTRIANS WHO HAVE BEEN INVOLVED IN ACCIDENTS

Subject's Last Name First Middle Initial

Street (Apt.) City State Zip

Age Sex Telephone

Where did it happen?

When?

Cause?

Problem as stated by patient?

INTERVIEW: Attempts to Contact Completed Date

1. Is your name

2. We are conducting research to try to find out how to make the country safer for pedestrians. As you (your) have/has recently been involved in an accident, we would like to ask you a few questions that may help us to prevent other people from having accidents or injuries.

If you would rather not discuss the accident, please say so; I won't take up any more of your time, and we won't call you again.

Your name will not be revealed to anyone unrelated to the study.

May I ask you some questions about the accident?

3. We are interested in any physical handicaps you may have had at the time of the accident.

- a) Did you have good vision? _____ (If no, find if legally blind or severity—i.e., vision in walking is very weak or poor).
- b) Did you have good hearing? _____ (If no, find if legally deaf or severity—i.e., hearing is very weak or poor).
- c) Did you use a crutch, a stick or any walking aid or a wheelchair? _____
What? _____
- d) Did you have a limp or any physical condition that made it difficult for you to walk? _____ What? _____
- e) Did you have anything wrong with your hands, arms or shoulders? _____
- f) Had you taken any medication, stimulants or drugs a short while before the accident? _____ What? _____

If subject is not over 65 or pre-school or of school age and was not handicapped at time of accident, END INTERVIEW.

4. Would you describe to me what happened in the accident, and what do you think caused it?

INTERVIEWER'S DIAGRAM OF THE ACCIDENT

Accident Account:

NOTE: If the accident was not a pedestrian accident, END INTERVIEW. Pedestrian accidents for this study may be in or out of doors, and include accidents in corridors, on steps, ramps, escalators, streets, sidewalks, driveways, entrances, hallways, etc., but not in domestic kitchens, bathrooms, bedrooms, livingrooms, etc. If in doubt, proceed with the interview.

NOTE: After Question 4, the remaining questions may be asked in any sequence and in any form; and further questions not listed here may be posed. The questions shown are illustrative and are intended to provide a topic check list.

5. Were the weather conditions at the time of the accident a problem?

Rain Snow Fog Wind Sleet Dust Ice Other

6. At the time of the accident, were you:

Going to work	Going to school	Going to car or bus	
Going shopping	Going to recreation	Playing	Other

7. Were you: Walking Running Hurrying Other

8. Was the accident:

On a road	On a sidewalk	On a driveway	
On steps	In a corridor	In a building	Other

QUESTIONS 9-15 REFER TO ACCIDENTS INVOLVING VEHICLES

9. If the accident was on a road, were you:

Crossing at a street intersection
Not crossing at a street intersection
Crossing from behind a parked vehicle
Getting off a vehicle
Walking in the roadway with traffic
Walking in the roadway against traffic
Playing in the roadway
Standing in the roadway
Moving onto the roadway from the curb
Moving off the roadway onto the curb
Other

10. If the accident involved a vehicle, was it:

Moving straight ahead	Making a right turn
Making a left turn	Slowing or stopping
Starting in the roadway	Starting from a parked position
Backing	Passing
Changing lanes or merging	Driving off the roadway
	Other

11. At the time of the accident, were you looking:

Straight ahead	Behind	To both sides
Right side only	Left side only	Up
Down	Generally around	Other

12. Were you looking at:

Moving vehicles	Traffic lights
Other people	Other non-moving objects
The street or sidewalk ahead	Curbs
Roadside items or street furniture	Other

13. What did you do to avoid the accident? Did you:

Take no action--unaware of need
Take no action--insufficient time
Take no action--walked or ran into vehicle
Stopped--remained in place
Walked--continued crossing
Walked--returned to roadside
Ran--returned to roadside
Other

14. Would you say that you:

Took a risk	Walked too slowly
Moved out too quickly to be seen	Ran into the road
Did not search adequately	Looked in the wrong direction
Did not pay attention to the traffic	Tried to beat the vehicle
Walked against the signal	Jaywalked

15. Do you think the roadway was dangerous because:

The roadway was inadequately lit
There were no roadway lights
There was no sidewalk
There were no shoulders or they were inadequate
You were blinded by the sun
You couldn't see because of a parked vehicle
You couldn't see because of a moving vehicle
You couldn't see because of standing traffic
Other

16. Did you: Slip Trip Stumble Lose balance Other

17. What caused this?

18. Did the accident happen because of:

Uneven surface	Slippery surface
Loose or broken surface	Couldn't see surface clearly
A curb	A threshold or step
Repairs of sidewalk	A grating
Steps or stairs	Something projecting
A pole or street furniture	A ramp
Too many people around	Insufficient space
Other	

19. Was the lighting good enough to see properly? Was it:

Daylight Twilight Dark with no lighting Dark with no road lighting Other

20. Were you walking alone? Accompanied Other

THANK YOU FOR YOUR COOPERATION

HANDEPED STUDY

Field Investigation of Accident Site

Accident Number _____ Location _____
Investigators _____ Date of Investigation _____

PHOTOGRAPH LOG:

No.	Description
1.	_____
2.	_____
3.	_____
4.	_____

FIXED OBJECT LOG:

Object	Size
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____

QUESTIONS:

1. Could a child (5 years old) use this street? _____
Why/Why not? _____
2. Could a blind person use this street? _____
Why/Why not? _____
3. Could a deaf person use this street? _____
Why/Why not? _____
4. Could a person in a wheelchair use this street? _____
Why/Why not? _____
5. Could other categories of handicapped people use this street? _____
Which categories? _____
Why/Why not? _____

COLLISION DIAGRAM:

Field Study Instructions

Equipment: City map, mileage log, accident report form, pencil, straightedge, police report information (if available), interview of accident victim, roll-a-tape, 50-foot steel tape, and camera.

Preliminary: Complete one accident report for each pedestrian accident or one accident report for each group of pedestrian accidents if they are clustered.

Condition Diagram:

1. Location: Label all streets by name. If the site is not close to an intersection, label the street address of several nearby buildings; show the approximate direction of the North arrow.
2. Street: Measure the curb to curb width of all streets; show the number of traffic lanes in each direction; if the street is a one-way street, show the direction of traffic movement; if the accident occurred at an intersection, measure both streets. If the intersection of the two streets is not approximately 90 degrees, make a rough measurement of the angle of intersection; also, "tie down" the location and measure the length and width of any traffic islands or other pedestrian facilities in the street.
3. Sidewalks: Measure the width of all sidewalks; also, measure the offset from the street to the sidewalk. Indicate the locations where no sidewalks exist and label each sidewalk type (concrete, dirt, gravel, etc.).
4. Curbs: Measure the heights of all curbs. Indicate the locations where curbs do not exist.
5. Pavement markings: Indicate the location of all pavement markings (stop lines, crosswalks, pavement word messages); measure the width of all crosswalks.
6. Traffic signals: Indicate the location of all traffic signals. "Tie down" any post mounted signals. Note the configuration of each traffic signal face (the number of optical units and their indication, particularly any arrows for turning movements); indicate where separate pedestrian signals "WALK, DON'T WALK" are provided.
7. Signs: Indicate the location and message of all important signs, ("PED XING, STOP, YIELD," etc.).
8. Fixed objects: "Tie down" all fixed objects which might restrict sight distance; measure the exact height above the ground and the approximate shape of the object.
9. Parking: Indicate all locations where parking is permitted and/or present; measure the width of the parking space and its distance from the intersection or crosswalk (if applicable).
10. Street furniture: Indicate the location of all street furniture (newspaper stands, benches, trash barrels, etc.). Measure the approximate height and shape of each object.
11. Bus stops: Indicate the location of all bus stops. "Tie down" the location of all bus stop posts.
12. Lighting: "Tie down" the location of all luminaries in the immediate area of the accident.

13. Miscellaneous: Indicate the location of all driveways, curb cuts, and sewer grates; show the directional orientation of the grates (parallel or perpendicular to the curb).

Collision Diagram:

1. Show the location of the accident as accurately as possible.
2. Show the approximate path of the vehicle (if any).
3. Show the approximate path of the pedestrian.
4. If more than one pedestrian is included on a single accident report, label each pedestrian by the appropriate code number (examples: A296 or P1117).

Photographs:

Preliminary: In most cases, no more than four (4) photographs should be taken at each accident site.

1. Photograph any unusually hazardous conditions:
 - a. Especially, sight distance problems--from an adult eye (height, 5 feet), and from a child or wheelchair eye (height, 3 feet). Sight distance problems are any situations which prevent the pedestrian and the vehicle from seeing each other.
 - b. Signals or signs that are illegible or not clear. Photographs of the traffic signal from the pedestrian's point of view could be particularly valuable.
 - c. Any objects in the pedestrian's path which could be hazardous

(sewer grates, street furniture at a crosswalk, etc.).

- d. Any unsafe pedestrian behavior that is witnessed (examples: crossing outside a crosswalk, crossing from between parked vehicles, crossing "against" a pedestrian or vehicular traffic signal).

PEDESTRIAN ACCIDENT SUMMARIES

(See General Causes and Countermeasures, Part 1)

1. Victim: 67 year old female

Handicap: elderly, nervousness

Description: The victim was walking aimlessly near her home on a rainy morning. She was trying to "settle her nerves." She started to cross a busy street in a crosswalk without the aid of a traffic control device. A vehicle, traveling in a straight line perpendicular to the crosswalk, hit the victim at the far side of the street in the crosswalk.

Specific Causes: The victim's handicap. The victim's failure to look for vehicles as she was crossing the street. The failure of the driver to yield the right of way to the pedestrian in the crosswalk. The provision of a crosswalk without a traffic control device on a busy street.

General Causes: C2, C6, C8, C9.

Specific Countermeasures: Remove the crosswalk at this intersection and direct pedestrian traffic to the adjacent signalized intersection. Prosecute the driver for failure to yield the right of way to the pedestrian in a crosswalk. Use a safety information program to convince pedestrians that drivers frequently violate traffic regulations.

General Countermeasures: CM2, CM8, CM9.

2. Victim: 82 year old male

Handicap: elderly

Description: The victim attempted to cross a busy street away from a crosswalk. He was hit and fatally

injured by a vehicle near the middle of the street. The vehicle may have been speeding.

Specific Causes: The victim's handicap. The victim's slow walking speed. The failure of the victim to use a nearby crosswalk. The provision of a nearby crosswalk without a traffic control device on a busy street. Possibly the speed of the vehicle.

General Causes: C2, C6, C7, C8.

Specific Countermeasures: Inspect the vehicular and pedestrian traffic patterns at the intersection for the possible installation of a traffic signal. Use a safety information program to inform elderly people about the dangers of crossing a street away from a crosswalk.

General Countermeasures: CM2, CM8.

3. Victim: 84 year old male

Handicap: elderly, poor vision, poor hearing, uses walking cane.

Description: The victim attempted to cross a busy street away from a crosswalk. Due to the rainy weather and his poor vision, he thought he was crossing in a marked crosswalk. The driver of the vehicle was unable to avoid the collision.

Specific Causes: The victim's disabilities. The weather conditions at the time of the accident. The victim's failure to use the available crosswalks. The proximity of the vehicular traffic and the pedestrian traffic.

General Causes: C3, C5, C7, C8.

Specific Countermeasure: Install a positive pedestrian barrier near the curb on both sides of the street.

General Countermeasures: CM3, CM8.

4. Victim: 73 year old female

Handicap: elderly

Description: The victim was standing on the front steps of her home. She was cleaning the palm leaves which hang close to the steps. The victim stepped backwards off a step and fell.

Specific Causes: The victim's handicap. Personal negligence. The inability of the victim to regain her balance.

General Cause: C8.

Specific Countermeasure: Provide information to elderly people about how and why to avoid dangerous situations such as walking down steps backwards.

General Countermeasure: CM8.

5. Victim: 81 year old female

Handicap: elderly, partially deaf, difficulty with walking

Description: The victim was exiting from the front passenger seat of an automobile at a service station. It was raining and the pavement was wet and slippery. The victim fell when she tried to stand on the wet pavement.

Specific Causes: The victim's handicap. The wet and slippery pavement.

General Causes: C8, C11.

Specific Countermeasures: Clean up the pavement around the service station area. Remove the grease and oil which accumulates on the pavements at these locations.

General Countermeasures: CM8, CM10.

6. Victim: 82 year old female

Handicap: elderly

Description: The victim was exiting from the senior citizen's home where she resides. She walked across the sidewalk toward the curb of the driveway. As the victim attempted to dismount from the curb, she caught her heel on the lip of the curb. This caused her to fall into the driveway.

Specific Causes: The victim's handicap and the design of the curb and sidewalk.

General Causes: C1, C8.

Specific Countermeasure: Remove the lip of the curb.

General Countermeasures: CM1, CM8.

7. Victim: 76 year old female

Handicap: elderly

Description: The victim was walking briskly on a sidewalk. She stubbed her toe on a rough spot on the sidewalk and fell.

Specific Causes: The victim's handicap and the rough spot on the pavement.

General Causes: C1, C8.

Specific Countermeasures: Provide information to elderly people about how and why to avoid dangerous situations such as rough spots on the pavement. Repair the sidewalk pavement.

General Countermeasures: CM1, CM8.

8. Victim: 74 year old female

Handicap: elderly

Description: The victim was walking across a major arterial street in a crosswalk while traffic on the street was stopped by a red light. A vehicle made a right turn from a parking lot behind her onto the street. The driver did not see the victim because a bright sun was in his eyes. The vehicle struck the victim, knocking her to the ground.

Specific Causes: The driver's failure to yield the right of way to the pedestrian in the crosswalk. The presence of a bright sun in the driver's eyes.

General Causes: C9, C12.

Specific Countermeasures: Prosecute the driver for failure to yield the right of way to the pedestrian in the crosswalk.

General Countermeasures: CM9.

9. Victim: 79 year old male

Handicap: elderly

Description: The victim started to

run across an arterial street in a crosswalk in order to catch a bus that was stopped across the street at a red light. He looked for vehicles to the right, but not to the left. A vehicle traveling on an intersecting street behind him made a right turn and struck the victim.

Specific Causes: The victim's failure to look for vehicles to the left before crossing the street. The driver's failure to yield the right of way to the pedestrian in the crosswalk. The presence of shrubbery near the intersection which obstructed visibility of the victim by the driver.

General Causes: C5, C9, C12.

Specific Countermeasures: Provide information to the elderly about safe pedestrian behavior. Prosecute the driver for failure to yield the right of way to the pedestrian in the crosswalk. Remove the shrubbery near the intersection.

General Countermeasures: CM8, CM9, CM11.

10. Victim: 76 year old female

Handicap: elderly, wears hearing aid, weak from a recent illness.

Description: The victim was walking hurriedly on a sidewalk along a major arterial street. She tripped on the sidewalk and fell to the ground, injuring her knee.

Specific Causes: The victim's handicaps. The poor condition of the sidewalk surface.

General Causes: C2, C8

Specific Countermeasures: Provide information to the elderly about safe pedestrian behavior. Improve the sidewalk surface.

General Countermeasures: CM2, CM8

11. Victim: 80 year old female

Handicap: elderly

Description: The victim was starting to walk across a collector street on a rainy evening at twilight. She was looking ahead and at moving vehicles on the street. As she stepped from the curb onto the street, a vehicle making a left turn from a sandy, unpaved driveway onto the street struck the victim, knocking her to the ground.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The time of day, the weather conditions, and the presence of shrubbery along the driveway, all of which decreased visibility of the victim by the driver.

General Causes: C7, C12

Specific Countermeasures: Provide information to the elderly about safe pedestrian behavior. Remove the shrubbery along the driveway.

General Countermeasures: CM8, CM11

12. Victim: 80 year old female

Handicap: elderly, uses a cane, has heart difficulty which causes dizziness.

Description: The victim was taking a long walk. She had to cross a street

to use the sidewalk on the opposite side. While she was crossing the street she fell on an uneven drainage grating.

Specific Causes: The victim's handicaps. The location of the grating in the typical pedestrian path. The lack of a marked crosswalk away from the drainage grating.

General Causes: C2, C8.

Specific Countermeasures: Elevate the grating to an approximately level surface. Make a clear and continuous path across the intersection. Extend the sidewalk to the curb. Use crosswalk stripes to route the pedestrians away from the drainage gratings. Install STOP signs on the Stillwood Road approaches to the intersection.

General Countermeasures: CM2, CM8.

13. Victim: 26 year old male

Handicap: cerebral palsy (uses crutches, brace on right leg), intoxicated.

Description: The victim had been drinking in a bar and had walked outside for fresh air. While walking on a deck in the rear of the building, he lost his balance and fell off the deck about 8 feet to the ground below, injuring his chest.

Specific Causes: The victim's handicaps. The failure to provide a railing at the edge of the deck.

General Causes: C1, C3, C12

Specific Countermeasures: Provide a railing at the edge of the deck. Provide information to the public,

and particularly to the handicapped, about the dangers associated with the overconsumption of alcoholic beverages.

General Countermeasures: CM1, CM3, CM2

14. Victim: 8 year old female

Handicap: child, very weak hearing

Description: The victim was running across an arterial street on a rainy evening at twilight. She was looking at the sidewalk ahead, and not at vehicular traffic on the street. A vehicle traveling on the street struck her, knocking her to the ground.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The victim's failure to consider vehicular traffic on the street before crossing. The failure of the victim's parents to educate her about safe pedestrian behavior. The time of day, the weather conditions, and the presence of a large tree along the street, all of which decreased visibility of the vehicle by the victim.

General Causes: C5, C7, C10, C12

Specific Countermeasures: Encourage parents to educate their children about safe pedestrian behavior. Provide information to school children about safe pedestrian behavior.

General Countermeasures: CM6, CM7.

15. Victim: 43 year old male

Handicap: taking medication for high blood pressure; poor vision

Description: The victim was waiting for the traffic signal to change at a busy intersection. When the signal changed, a vehicle stopped in the crosswalk. Several pedestrians crossed in front of the vehicle. The victim and several other pedestrians attempted to cross behind the vehicle in the crosswalk. The driver backed up and hit the victim.

Specific Causes: The victim's handicap. The driver's indiscretion in stopping across the crosswalk and carelessly backing up. The absence of a stop line at this approach.

General Causes: C2, C9

Specific Countermeasures: Paint a stop line behind the crosswalk on the south approach to the intersection. Prosecute the driver for stopping across a crosswalk and backing into a crosswalk.

General Countermeasures: CM2, CM9

16. Victim: 10 year old male

Handicap: child, poor vision without eyeglasses

Description: The victim attempted to run across a busy street away from a crosswalk. He was not wearing his eyeglasses. This apparently caused him to run into a moving vehicle. The vehicle was not speeding.

Specific Causes: The victim's handicaps. The victim's failure to wear his eyeglasses. The victim's failure to use the nearby crosswalk. The provision of a nearby crosswalk without a traffic control device on a busy street.

General Causes: C2, C5, C7, C10.

Specific Countermeasures: Inspect the vehicular and pedestrian traffic pattern at the intersection for the possible installation of a traffic signal. Use a school safety program to make children aware of the danger involved in crossing outside the crosswalk.

General Countermeasures: CM2, CM6, CM7

17. Victim: 64 year old female

Handicap: poor vision in dim light

Description: The victim was walking in an interior corridor. As she started to descend some steps, she lost her balance and fell. The corridor was dimly lighted and the victim could not see the steps too well.

Specific Causes: The victim's handicap. The inadequate illumination of the steps.

General Cause: C1

Specific Countermeasure: Improve the illumination of the steps.

General Countermeasure: CM1

18. Victim: 5 year old female

Handicap: child, very weak vision

Description: The victim was walking across a collector street. She saw an approaching vehicle traveling on the street, but continued to walk into the vehicle. The vehicle struck the victim.

Specific Causes: The victim's handicap. The victim's failure to consider vehicular traffic on the street while crossing. The failure of the victim's parents to buy her glasses, and to educate her about safe pedestrian behavior.

General Causes: C6, C10

Specific Countermeasures: Encourage parents to have their children's vision checked and, if necessary, corrected. Encourage parents to educate their children about safe pedestrian behavior.

General Countermeasures: CM6

19. Victim: 10 year old male

Handicap: child

Description: The victim and a friend were going to the store. They attempted to cross a busy street away from a crosswalk. The friend safely ran across the street. The victim was hit by a skidding vehicle.

Specific Causes: The victim's handicap. The victim failed to look for conflicting vehicular traffic and he failed to use the nearby crosswalk. The provision of a nearby crosswalk without a traffic control device on a busy street.

General Causes: C2, C5, C7, C10.

Specific Countermeasures: Use a school safety program to emphasize the importance of checking for conflicting vehicular traffic. Illustrate the proper use of a crosswalk. Provide a traffic control device at the crosswalk or remove the crosswalk.

General Countermeasures: CM2, CM6, CM7

20. Victim: 10 year old male

Handicap: child

Description: The victim was rushing to cross a busy street away from a crosswalk. He entered the street from behind a telephone pole without looking for conflicting vehicular traffic. The victim ran into the path of a moving vehicle.

Specific Causes: The victim's handicap. The pedestrian failed to look for conflicting vehicular traffic. The pedestrian did not use the nearby crosswalk. The provision of a nearby crosswalk without a traffic control device on a busy street.

General Causes: C2, C5, C7, C10

Specific Countermeasures: Use a school safety program to illustrate the dangers of crossing the street without looking for conflicting vehicular traffic. Emphasize the proper use of a crosswalk. Provide a traffic control device at the crosswalk or remove the crosswalk.

General Countermeasures: CM2, CM6, CM7

21. Victim: 4 year old male

Handicap: child

Description: During the confusion of another serious incident the victim was temporarily left unattended by his mother. The child wandered into a busy street from a small adjacent parking lot. The victim was struck by a vehicle in the street.

Specific Causes: The victim's handicap. Temporary neglect by the parent. The lack of any delineation between the parking lot and the contiguous street. The absence of a sidewalk.

General Causes: C3, C10

Specific Countermeasure: Delineate the parking lot from the street by the use of a sidewalk or curb.

General countermeasures: CM3, CM6

22. Victim: 11 year old male

Handicap: child

Description: The victim was taking a shortcut on his way to school. He saw the approaching vehicle while he was at the side of the street but he thought that he could cross in front of the vehicle. His evaluation was incorrect and he was struck by the vehicle in the curb lane. The vehicle was unable to avoid the collision.

Specific Cause: The victim's handicap. The pedestrian misjudged the speed of the approaching vehicle. The appearance of the pedestrian was unexpected and possibly obstructed by the overgrown weeds. The access across the railroad tracks available to the pedestrian is unsafe.

General Causes: C2, C3, C5, C6, C10

Specific Countermeasures: Use a school safety program to teach children how to judge the speed of an approaching vehicle. Remove the bus stop from this intersection. Erect a fence between the street and the railroad tracks. Encourage pedestrians to use the crosswalk at the next intersection.

General Countermeasures: CM2, CM3, CM5, CM6, CM7

23. Victim: 12 year old male

Handicap: child

Description: The victim dismounted from a school bus and waited at the side of the road. As the bus began to pull away the child ran across the street behind the bus. A speeding vehicle, traveling on the same street in the opposite direction, hit the victim as he ran across the street.

Specific Causes: The victim's handicap. The victim failed to cross the street in front of the stopped school bus in accordance with proper safety procedures. The driver of the accident vehicle was traveling too fast to avoid the collision.

General Causes: C5, C7, C9, C10

Specific Countermeasures: Demonstrate the dangers of crossing behind a slow moving bus to the children and the bus drivers in a school safety program. Convince them that automobile drivers frequently violate traffic regulations. Prosecute the driver for speeding.

General Countermeasures: CM5, CM7, CM9

24. Victim: 6 year old female

Handicap: child

Description: The child ran across the street toward her house. A vehicle, traveling in the downhill direction, was unable to avoid the collision. The accident occurred away from the intersection.

Specific Causes: The victim's handicap. The failure of the victim to check for conflicting vehicular traffic. The use of a residential street as a through route.

General Causes: C4, C5, C10

Specific Countermeasures: Use a temporary vehicular barrier to divert northbound traffic from Crest Street to Hatcher Avenue. Use a school safety program to teach children how to cross a residential street.

General Countermeasures: CM4, CM6, CM7

25. Victim: 10 year old male

Handicap: child

Description: The victim was on his way home from visiting his mother at work. He attempted to run across a street at a location away from a crosswalk. An unseen car came over a nearby hill in the far lane. When the boy saw the car, he "froze" and was struck by the vehicle in the street.

Specific Causes: The victim's handicap. The failure of the victim to cross the street using the crosswalk at a nearby signalized intersection. The vertical curvature of the street. The lack of a sidewalk on the north side of the street.

General Causes: C2, C3, C6, C7, C10

Specific Countermeasures: Improve the existing crosswalk at the signalized intersection. Repaint the crosswalk stripes and install pedestrian signals. Use a school safety program to inform children about the dangers

of crossing a street away from a crosswalk. A barrier on the sidewalk below the crest of the vertical curve might also be considered.

General Countermeasures: CM2, CM3, CM7

26. Victim: 15 year old female

Handicap: child

Description: The victim was going to school at the time of the accident. She attempted to run across the street away from a crosswalk without looking for conflicting vehicular traffic. The victim ran into the path of a following vehicle.

Specific Causes: The failure of the pedestrian to check for conflicting vehicular traffic. The absence of a continuously paved sidewalk on the west side of the street.

General Causes: C2, C5, C7

Specific Countermeasures: Provide a clear and continuous pedestrian path across the intersection. Extend the paved sidewalk on the west side of Pryor Street from Melton Road to Thornton Road.

General Countermeasure: C2

27. Victim: 6 year old male

Handicap: child

Description: The victim was walking to school in the early morning darkness. He started to cross a busy street in a crosswalk at a signalized intersection. The victim apparently obeyed the vehicular and pedestrian traffic signals. He was struck by a

vehicle near the middle of the crosswalk. The vehicle apparently obeyed the vehicular traffic signal.

Specific Causes: The pedestrian crossing time provided by the traffic signal is inadequate. The illumination of the intersection is also not sufficient. The pedestrian did not look for a vehicle as he was crossing the street.

General Causes: C2, C6

Specific Countermeasures: Modify the traffic signal to provide adequate pedestrian crossing time. Provide more illumination at the intersection or delay the start of the school day until daylight is sufficient. Use a school safety program to convince children that drivers frequently violate traffic regulations.

General countermeasures: CM2, CM5, CM6, CM7

28. Victim: 15 year old male

Handicap: child

Description: The victim was attempting to cross a busy street at a signalized intersection. He was trying to cross the street "against the light." Two cars in the curb lane stopped to let the victim cross. He was hit by a vehicle in the outside lane near the middle of the crosswalk.

Specific Causes: The victim's indiscretion in crossing without the proper right of way. The failure to provide a stop line on the intersection approach.

General Causes: C2, C6

Specific Countermeasure: Paint stop lines on the intersection approach behind the crosswalks.

General Countermeasure: CM2

29. Victim: 4 year old female

Handicap: child

Description: The victim attempted to cross a street away from a crosswalk. She ran in front of a vehicle and a collision occurred. The accident location was near the victim's home and the victim was unaccompanied. The child may have run from between parked vehicles and the accident vehicle may have been speeding.

Specific Causes: The victim's handicap. The victim is too young to cross the street by herself. The vehicle was probably traveling too fast. The use of a residential street as a through street.

General Causes: C3, C9, C10

Specific Countermeasure: Use a temporary vehicular barrier to divert traffic from Cooper Street.

General Countermeasures: CM3, CM6, CM9

30. Victim: 9 year old male

Handicap: child

Description: The victim was running through the school grounds on an errand. He entered the school parking lot from behind a seven foot stone wall. A vehicle, moving through the parking lot, was unable to avoid the collision.

Specific Causes: The victim's handicap. The failure of the pedestrian to check for conflicting vehicular traffic. The design of the parking lot.

General Causes: C2, C5, C10

Specific Countermeasures: Reverse the direction of vehicular circulation in the parking lot. Refocus the direction of the sidewalk in the parking island away from the stone wall. Remove parts of the parking lot and extend the stone wall for a short distance at a lower height.

General Countermeasures: CM2, CM6, CM7

31. Victim: 6 year old female

Handicap: child

Description: The victim attempted to cross a street in a crosswalk at an intersection of two sloping streets. A vehicle on the same street entered the intersection from the downhill approach. The vehicle apparently failed to obey the STOP sign and hit the victim in the crosswalk.

Specific Causes: The failure of the vehicle to obey the STOP sign and to yield right of way to the pedestrian in the crosswalk. Also, the inability of the crossing pedestrian to see the approaching vehicle due to the sloping roadway.

General Causes: C2, C5, C9

Specific Countermeasures: Encourage vehicles to come to a complete stop at this intersection. An additional STOP sign on the uphill approach would be appropriate. Use a safety information program to convince pedestrians that drivers fre-

quently violate traffic regulations.

General Countermeasures: CM2,
CM6, CM7, CM9

32. Victim: 4 year old female

Handicap: child

Description: The victim was holding her baby sitter's hand as she climbed some irregular stone steps at a park near her home. She stumbled on the steps and fell.

Specific Causes: The victim's handicap. The child's inability to climb the steps. The design and condition of the steps.

General Cause: C1

Specific Countermeasures: Make "natural" pedestrian facilities as safe as possible without adversely affecting the original condition. Install hand rails next to the steps. Clear the steps of weeds, grass and overhanging bushes.

General Countermeasures: CM1,
CM10

33. Victim: 13 year old male

Handicap: child

Description: The victim was walking across a major arterial street in a crosswalk while traffic on the street was stopped by a red light. He was looking at the sidewalk ahead. A vehicle traveling on the street did not stop at the red light and struck the victim, knocking him to the ground.

Specific Causes: The driver's failure to stop at the red light, and his failure to yield the right of way to

the pedestrian in the crosswalk.

General Causes: C9

Specific Countermeasures: Prosecute the driver for failure to stop at the red light, and for failure to yield the right of way to the pedestrian in the cross walk.

General Countermeasures: CM9

34. Victim: 2 year old female

Handicap: child

Description: The victim was playing on a vacant lot. She lost her balance and fell backward into a sewer ditch, injuring her arm.

Specific Causes: The failure of the victim's parents to educate her about safety and to supervise her properly.

General Causes: C10

Specific Countermeasures: Encourage parents to take more responsibility for the education and supervision of their children.

General Countermeasures: CM6

35. Victim: 2 year old male

Handicap: child

Description: The victim was playing. He ran from behind a parked car onto a collector street. The driver of a vehicle traveling on the street did not see the victim entering the street. The vehicle struck the victim, knocking him to the ground.

Specific Causes: The failure of the victim's parents to educate him about safety and to supervise him properly.

General Causes: C10

Specific Countermeasures: Encourage parents to teach their children not to play in streets, particularly those with high traffic volumes.

General Countermeasures: CM6

36. Victim: 3 year old male

Handicap: child

Description: The victim was playing with other children on a local street. As a vehicle backed from a driveway onto the street, the victim was pushed by one of the other children into the vehicle. The vehicle struck the victim, knocking him to the ground.

Specific Causes: The failure of the victim's parents to educate him about safety and to supervise him properly.

General Causes: C10

Specific Countermeasures: Encourage parents to teach their children not to play in streets.

General Countermeasures: CM6

37. Victim: 8 year old male

Handicap: child

Description: The victim was running across a local street. He was looking at the curb ahead, and not at vehicular traffic on the street. A vehicle traveling on the street struck him, knocking him to the ground.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The victim's failure to consider vehicular traffic on the

street before crossing. The failure of the victim's parents to educate him about safe pedestrian behavior.

General Causes: C5, C7, C10

Specific Countermeasures: Encourage parents to educate their children about safe pedestrian behavior. Provide information to school children about safe pedestrian behavior.

General Countermeasures: CM6, CM7

38. Victim: 8 year old male

Handicap: child

Description: The victim was running across a collector street on his way home from school. He was looking at other people ahead. A vehicle traveling on the street struck the victim.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The failure of the victim's parents to educate him about safe pedestrian behavior. The lack of adequate horizontal sight distance between the driver and the victim resulting from the horizontal curvature of the street and the presence of vegetation along the street.

General Causes: C5, C10, C12

Specific Countermeasures: Encourage parents to educate their children about safe pedestrian behavior. Provide information to school children about safe pedestrian behavior.

General Countermeasures: CM6, CM7

39. Victim: 7 year old male

Handicap: child

Description: The victim had alighted from a school bus on a collector street and had walked around the front of the bus in order to cross the street. As he started to walk across the street, a vehicle traveling on the street passed the stopped school bus and struck the victim.

Specific Causes: The driver's failure to stop behind the stopped school bus. The location of the school bus stop on a curve where it is not visible to drivers.

General Causes: C2, C9

Specific Countermeasures: Prosecute the driver for failure to stop behind the stopped school bus. Locate school bus stops where they are visible to drivers.

General Countermeasures: CM2, CM9

40. Victim: 6 year old female

Handicap: child

Description: The victim was walking across a local street at an intersection. She saw an approaching vehicle traveling on an intersecting street behind her, but assumed that the vehicle would stop at the stop sign. However, the vehicle did not stop; it made a right turn and struck the victim, knocking her to the ground.

Specific Causes: The driver's failure to stop at the stop sign. The presence of shrubbery near the intersection which obstructed visibility of

the victim by the driver.

General Causes: C9, C12

Specific Countermeasures: Prosecute the driver for failure to stop at the stop sign. Remove the shrubbery near the intersection

General Countermeasures: CM9, CM11

42. Victim: 8 year old female

Handicap: child

Description: The victim had alighted from a school bus on a collector street and had walked around the front of the bus in order to cross the street. As she started to walk across the street, a vehicle traveling on the street passed the stopped school bus and struck the victim, injuring her head and leg.

Specific Causes: The driver's failure to stop behind the stopped school bus.

General Causes: C9

Specific Countermeasures: Prosecute the driver for failure to stop behind the stopped school bus.

General Countermeasures: CM9

43. Victim: 9 year old male

Handicap: child

Description: The victim was running across an arterial street on his way home from school without considering vehicular traffic on the street. A vehicle traveling on the street struck the victim, injuring his leg.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The victim's failure to consider vehicular traffic on the street before crossing. The failure of the victim's parents to educate him about safe pedestrian behavior.

General Causes: C5, C7, C10

Specific Countermeasures: Encourage parents to educate their children about safe pedestrian behavior. Provide information to school children about safe pedestrian behavior.

General Countermeasures: CM6, CM7

44. Victim: 4 year old male

Handicap: child

Description: The victim started to run across a collector street without considering vehicular traffic on the street. A vehicle traveling on the street struck the victim, injuring his ankle.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The victim's failure to consider vehicular traffic on the street before crossing. The failure of the victim's parents to educate him about safety and to supervise him properly.

General Causes: C5, C7, C10

Specific Countermeasures: Encourage parents to take more responsibility for the education and supervision of their children.

General Countermeasures: CM6

45. Victim: 3 year old female

Handicap: child

Description: The victim started to run across a collector street without considering vehicular traffic on the street. A vehicle traveling on the street struck the victim, injuring her arm.

Specific Causes: The victim's failure to consider vehicular traffic on the street before crossing. The failure of the victim's parents to educate her about safety and to supervise her properly.

General Causes: C5, C10

Specific Countermeasures: Encourage parents to take more responsibility for the education and supervision of their children.

General Countermeasures: CM6

46. Victim: 14 year old male

Handicap: child

Description: The victim had alighted from a bus on an arterial street and had walked around the front of the bus in order to cross the street on his way home from school. As he started to walk across the street, he saw an approaching vehicle traveling on an intersecting street ahead of him, but assumed that the vehicle would stop at the stop sign. However, the vehicle did not stop; it made a right turn and struck the victim, knocking him to the ground.

Specific Causes: The driver's failure to stop at the stop sign. The victim's failure to cross in a crosswalk near the bus stop.

General Causes: C7, C9

Specific Countermeasures: Prosecute the driver for failure to stop at the stop sign. Relocate the bus stop by the crosswalk.

General Countermeasures: CM2, CM9

47. Victim: 8 year old male

Handicap: child

Description: The victim was walking home across a collector street in a crosswalk while traffic on the street was stopped by a school safety patrol. A vehicle traveling on the street did not stop at the crosswalk and struck the victim, knocking him to the ground.

Specific Causes: The driver's failure to stop at the crosswalk while the safety patrol stopped traffic, and his failure to yield the right of way to the pedestrians in the crosswalk.

General Causes: C9

Specific Countermeasures: Prosecute the driver for failure to stop at the crosswalk while the safety patrol stopped traffic, and for failure to yield the right of way to the pedestrians in the crosswalk. Teach school children that drivers frequently violate traffic regulations.

General Countermeasures: CM7, CM9

48. Victim 10 year old male

Handicap: child

Description: The victim was walking

at night across a local street while a vehicle on the street was stopped at a stop sign. The victim first waited to allow the vehicle to go, but the vehicle did not go. The victim then started to walk across the street (thinking that the vehicle would not go), but the vehicle went (the driver thinking that the pedestrian would wait) and struck the victim.

Specific Causes: The misunderstanding on the part of both the victim and the driver. The driver's failure to yield the right of way to the pedestrian at the stop sign.

General Causes: C9

Specific Countermeasures: Prosecute the driver for failure to yield the right of way to the pedestrian at the stop sign.

General Countermeasures: CM9

49. Victim: 7 year old female

Handicap: child

Description: The victim was playing behind a parked car on a local street and suddenly ran from behind the parked car into the street. A vehicle traveling on the street struck the victim, knocking her to the ground.

Specific Causes: The failure of the victim's parents to educate her about safety.

General Causes: C10

Specific Countermeasures: Encourage parents to teach their children not to play in streets.

General Countermeasures: CM6

50. Victim: 6 year old female

Handicap: child

Description: The victim had alighted from her parents' car across a collector street from her school and had walked around the front of the car in order to cross the street. As a vehicle made a left turn from the school driveway onto the street, she started to walk across the street. At the same time, a vehicle traveling on the street (whose view of the pedestrian had been blocked by the turning vehicle) struck the victim, knocking her to the ground.

Specific Causes: The victim's failure to cross in a crosswalk or at an intersection. The victim's failure to consider vehicular traffic on the street while crossing. The failure of the victim's parents to educate her about safe pedestrian behavior. The failure of the victim's parents to use the school driveway to deposit her.

General Causes: C6, C7, C10

Specific Countermeasures: Encourage parents to educate their children about safe pedestrian behavior. Encourage parents to use the school driveway to deposit their children. Provide information to school children about safe pedestrian behavior.

General Countermeasures: CM6, CM7

ACCIDENT DATA FROM FIVE-CITY SURVEY

Table 20: Interviewed Subjects by Subgroup: 5 Cities Total

Handicap	Male			Female			Total
	White	Black	Hispanic	White	Black	Hispanic	
Developmental Restrictions	6	1	3	0	1	0	13
Chronic Restrictions (agility/stamina/ reaction time)	15	2	0	1	6	0	40
Wheelchair Users	31	4	0	2	1	0	62*
Walks w/ Special Aids	26	4	1	1	4	0	57
Walks w/ Difficulty	17	4	1	0	1	1	36
Upper Extremities	5	0	0	0	0	0	8
Severe Auditory Impairment	19	2	0	0	1	0	38
Severe Visual Impairment	22	9	0	0	2	1	52
Confused/ Disoriented	16	1	1	0	1	1	32
Totals	157	27	6	4	17	3	338+
*9 electric wheelchairs							
+includes children							

Table 21: Interviewed Subjects by Subgroup: Florida/St. Petersburg
and Tampa

Handicap	Male				Female				
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental	Total
Developmental Restrictions	1	0	0	0	0	0	0	0	1
Chronic Restrictions (agility/stamina/ reaction time)	5	1	0	0	7	0	0	0	13
Wheelchair Users	8	0	0	0	9	0	0	0	17*
Walks w/ Special Aids	7	0	0	0	5	0	0	0	12
Walks w/ Difficulty	2	1	0	0	0	0	0	0	3
Upper Extremities	0	0	0	0	0	0	0	0	0
Severe Auditory Impairment	12	2	0	0	6	0	0	0	20
Severe Visual Impairment	7	5	0	0	7	0	1	0	20
Confused/ Disoriented	4	0	0	0	1	1	0	0	6
Totals	46	9	0	0	35	1	1	0	92
*One electric wheelchair									

Table 22: Interviewed Subjects by Subgroup: Illinois/Chicago

Handicap	Male			Female			Total
	White	Black	Hispanic	White	Black	Hispanic	
Developmental Restrictions	3	1	3	1	1	0	9+
Chronic Restrictions (agility/stamina/ reaction time)	3	0	0	2	1	0	6
Wheelchair Users	8	1	0	3	1	0	13*
Walks w/ Special Aids	4	1	0	3	1	0	9
Walks w/ Difficulty	4	0	0	2	0	0	6
Upper Extremities	2	0	0	2	0	0	4
Severe Auditory Impairment	0	0	0	0	0	0	0
Severe Visual Impairment	1	1	0	5	0	0	7+
Confused/ Disoriented	8	1	1	8	1	0	19
Totals	33	5	4	26	5	0	73
*One electric wheelchair +Of the 9 interviewed with dimensional disabilities, 7 were children. Of the 7 interviewed with visual impairments, one was a child.							

Table 23: Interviewed Subjects by Subgroup: California/San Francisco

Handicap	Male				Female			
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental
Developmental Restrictions	1	0	0	0	1	0	0	0
Chronic Restrictions (agility/stamina/ reaction time)	1	0	0	1	1	0	0	0
Wheelchair Users	5	1	0	1	4	0	0	1
Walks w/ Special Aids	5	1	1	1	4	2	0	1
Walks w/ Difficulty	8	2	1	0	6	0	1	1
Upper Extremities	2	0	0	0	0	0	0	0
Severe Auditory Impairment	2	0	0	0	4	0	0	0
Severe Visual Impairment	3	1	0	0	2	0	0	0
Confused/ Disoriented	1	0	0	0	1	0	0	0
Totals	28	5	2	3	23	2	1	3
*Two were electric wheelchairs								
								67

Table 24: Interviewed Subjects by Subgroup: Washington/Seattle

Handicap	Male				Female			
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental Total
Developmental Restrictions	1	0	0	0	0	0	0	1
Chronic Restrictions (agility/stamina/ reaction time)	6	1	0	0	5	0	0	13
Wheelchair Users	7	0	0	1	5	0	0	13*
Walks w/ Special Aids	8	0	0	0	3	1	0	12
Walks w/ Difficulty	3	1	0	0	3	0	0	7
Upper Extremities	1	0	0	0	1	0	0	2
Severe Auditory Impairment	1	0	0	0	1	0	0	2
Severe Visual Impairment	8	0	0	0	2	0	0	10
Confused/ Disoriented	3	0	0	0	2	0	0	5
Totals	38	2	0	1	22	1	0	65
*Two were electric wheelchairs								

Table 25: Interviewed Subjects by Subgroup: Georgia/Atlanta

Handicap	Male			Female			Total
	White	Black	Hispanic	White	Black	Hispanic	
Developmental Restrictions	0	0	0	0	0	0	0
Chronic Restrictions (agility/stamina/ reaction time)	0	0	0	0	5	0	5
Wheelchair Users	3	2	0	2	0	0	7*+
Walks w/ Special Aids	2	2	0	5	0	0	9
Walks w/ Difficulty	0	0	0	0	1	0	1
Upper Extremities	0	0	0	0	0	0	0
Severe Auditory Impairment	4	0	0	5	1	0	10+
Severe Visual Impairment	3	2	0	2	2	0	9
Confused/ Disoriented	0	0	0	0	0	0	0
Totals	12	6	0	14	9	0	41

*2 are electric wheelchairs

+Of the 10 interviewed who have auditory impairments, 8 were children. Of the 7 interviewed who were in wheelchairs, one was a child.

Table 26: Survey of Pedestrian Accidents Involving the Elderly and Handicapped:
St. Petersburg/Tampa (38 Subjects)

Handicap	Age	Sex				Type	Component						Accident																	
		Male		Female																										
		W	B	H	O		W	B	H	O	1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9
Developmental Restrictions	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
Chronic Restrictions (agility/stamina/reaction time)	0 2 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0
Wheelchair Users	1 10 1	4 0 0	0 0 0	8 0 0	0 0 0	8 3 1	0 0 0	4 3 0	3 2 0	0 0 0	6 0 2	0 2 1	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0
Walks w/ Special Aids	1 7 2	4 1 0	0 0 0	5 0 0	0 0 0	8 1 1	0 0 0	5 1 0	4 0 0	0 0 0	6 0 1	0 1 0	1 0 0	1 0 0	0 0 0	6 0 1	0 1 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
Walks w/Difficulty	0 2 1	2 0 0	0 0 0	1 0 0	0 0 0	1 1 1	0 0 0	1 0 0	0 0 0	2 0 0	1 0 0	0 0 0	1 0 0	0 0 0	2 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0
Upper Extremities	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
Severe Auditory Impairment	0 2 0	1 0 0	0 0 0	1 0 0	0 0 0	1 1 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0
Severe Visual Impairment	1 3 3	2 1 0	0 0 0	3 0 1	0 0 0	1 4 2	0 0 0	2 2 0	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0	0 0 0	2 1 1	0 3 0
Confused/Disoriented	1 1 0	2 0 0	0 0 0	0 0 0	0 0 0	0 0 2	0 0 0	0 2 0	0 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0	1 0 0	0 0 0
Totals	4 27 7	16 2 0	0 0 0	19 0 1	0 0 0	20 11 6	0 0 0	14 8 1	7 6 2	0 0 0	18 1 5	0 7 1	1 1 1	1 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1	2 1 1

Legend:

Age

C Child

A Adult

E Elderly

Population Group

W White

B Black

H Hispanic

O Oriental

Accidents--Type

1. Falls on level

2. Falls changing levels

3. Pedestrian hit by vehicle

4. Pedestrian and pedestrian

Components

1. Walkways

2. Intersections

3. Parking lots/garages

4. Public spaces/parks/recreation

5. Building entries/lobbies

6. Bus stops/terminals

7. Vehicle interior

Elements

1. Walks, corridors

2. Crosswalks

3. Curbs, curbeuts

4. Ramps

5. Stairs

6. Handrails

7. Gratings, manhole covers

8. Signals

9. Pick-up, waiting areas

10. Doors, lobbies

11. Illumination

Table 27: Survey of Pedestrian Accidents Involving the Elderly and Handicapped: Chicago (43 Subjects)

Handicap	Age	Sex						Type				Component						Accident															
		Male			Female			Type				Component						Accident															
		C	A	E	W	B	H	O	W	B	H	O	1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10
Developmental Restrictions	7	2	0	4	1	2	0	2	0	0	0	3	3	3	0	4	2	0	0	2	1	0	3	2	0	0	3	0	0	0	0	0	1
	0	0	3	1	0	0	0	2	0	0	0	2	1	0	0	2	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0
	1	8	1	4	1	0	0	3	2	0	0	7	1	1	1	5	4	0	1	0	0	0	5	2	1	0	0	0	2	0	0	0	0
	0	4	1	3	0	0	0	2	0	0	0	3	1	1	0	4	1	0	0	0	0	0	4	0	0	0	1	0	0	0	0	0	0
	0	2	1	1	0	0	0	2	0	0	0	1	0	2	0	1	2	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
Upper Extremities	0	2	0	2	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Severe Visual Impairment	0	7	0	2	1	0	0	4	0	0	0	1	3	3	0	2	3	0	0	1	1	0	1	2	1	1	1	1	0	0	0	1	0
	0	3	1	1	1	0	0	2	0	0	0	1	1	2	0	1	2	0	0	1	0	0	1	2	0	0	1	0	0	0	0	0	0
Totals	8	28	7	18	4	2	0	17	2	0	0	18	11	13	1	19	15	0	1	5	3	0	17	11	2	1	7	0	2	0	0	2	1

Legend:	Age	Accidents—Type	Components	Elements
C	Child	1. Falls on level	1. Walkways	1. Walks, corridors
A	Adult	2. Falls changing levels	2. Intersections	2. Crosswalks
E	Elderly	3. Pedestrian hit by vehicle	3. Parking lots/garages	3. Curbs, curbcuts
		4. Pedestrian and pedestrian	4. Public spaces/parks/recreation	4. Ramps
			5. Building entries/lobbies	5. Stairs
			6. Bus stops/terminals	6. Handrails
			7. Vehicle interior	7. Gratings, manhole covers
				8. Signals
				9. Pick-up, waiting areas
				10. Doors, lobbies
				11. Illumination

Table 28: Survey of Pedestrian Accidents Involving the Elderly and Handicapped: San Francisco (41 Subjects)

Handicap	Age	Sex				Accident																									
		Male		Female		Type	Component						Element																		
		W	B	H	O		W	B	H	O	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11			
Developmental Restrictions	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Chronic Restrictions (agility/stamina/reaction time)	0 2 4	2	0	0	1	2	0	0	1	2	2	2	0	2	3	0	0	1	0	0	1	2	2	0	1	0	0	0	0		
Wheelchair Users	0 5 3	3	1	0	0	4	0	0	0	5	3	0	0	5	2	0	0	1	0	0	5	1	1	0	1	0	0	0	0		
Walks w/ Special Aids	0 11 3	9	0	0	0	2	2	1	0	4	7	2	1	2	5	2	0	4	1	0	2	3	1	1	5	1	1	0	0	0	
Walks w/Difficulty	0 2 0	0	1	0	0	1	0	0	0	1	0	1	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
Upper Extremities	0 1 0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Severe Auditory Impairment	0 3 0	1	0	0	0	2	0	0	0	1	0	2	0	1	2	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
Severe Visual Impairment	0 4 0	1	1	0	0	2	0	0	0	2	1	1	0	3	0	0	0	1	0	0	1	1	0	0	1	0	1	0	0	0	0
Confused/Disoriented	0 2 1	1	0	0	1	1	0	0	1	2	0	1	0	2	1	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0
Totals	0 30 11	18	3	0	2	14	2	1	1	17	13	10	1	16	15	2	0	7	1	0	12	12	4	1	8	1	3	0	0	0	0

Legend:	Age	Accidents—Type	Components	Elements
C	Child	1. Falls on level	1. Walkways	1. Walks, corridors
A	Adult	2. Falls changing levels	2. Intersections	2. Crosswalks
B	Elderly	3. Pedestrian hit by vehicle	3. Parking lots/garages	3. Curbs, curbside
		4. Pedestrian and pedestrian	4. Public spaces/parks/recreation	4. Ramps
			5. Building entries/lobbies	5. Stairs
			6. Bus stops/terminals	6. Handrails
			7. Vehicle interior	7. Gratings, manhole covers
				8. Signals
				9. Pick-up, waiting areas
				10. Doors, lobbies
				11. Illumination

Table 29: Survey of Pedestrian Accidents Involving the Elderly and Handicapped: Seattle (36 Subjects)

Handicap	Age C A E	Sex				Accident																										
		Male		Female		Type	Component						Element																			
		W	B	H	O	W	B	H	O	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11					
Developmental Restrictions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	0	3	5	2	1	0	0	4	0	0	1	4	3	1	0	0	2	0	3	2	0	1	1	2	1	0	1	1	0	0	1	0
	0	5	2	3	0	0	0	4	0	0	0	4	3	0	0	3	2	0	1	1	0	0	3	0	3	1	0	0	0	0	0	0
	0	9	0	8	0	0	0	1	0	0	0	6	2	1	0	5	1	0	2	1	0	0	5	0	2	1	1	0	0	0	0	0
Walks w/Difficulty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	0	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
	0	9	0	6	0	0	0	3	0	0	0	1	6	2	0	2	3	3	0	1	0	0	0	2	0	1	5	1	0	0	0	0
Severe Visual Impairment	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	9	0	6	0	0	0	3	0	0	0	1	6	2	0	2	3	3	0	1	0	0	0	2	0	1	5	1	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	27	9	21	1	0	0	13	0	0	1	17	15	4	0	11	10	3	6	5	0	1	11	4	7	3	7	2	1	0	0	1
Totals																																

Legend:	Age	Accidents--Type	Components	Elements
C	Child	1. Falls on level	1. Walkways	1. Walks, corridors
A	Adult	2. Falls changing levels	2. Intersections	2. Crosswalks
E	Elderly	3. Pedestrian hit by vehicle	3. Parking lots/garages	3. Curbs, curbeuts
		4. Pedestrian and pedestrian	4. Public spaces/parks/ recreation	4. Ramps
			5. Building entries/lobbies	5. Stairs
			6. Bus stops/terminals	6. Handrails
			7. Vehicle interior	7. Gratings, manhole covers
				8. Signals
				9. Pick-up, waiting areas
				10. Doors, lobbies
				11. Illumination

Table 30: Survey of Pedestrian Accidents Involving the Elderly and Handicapped: Atlanta (16 Subjects)

Handicap	Age	Sex								Accident																												
		Male				Female				Type			Component						Element																			
		C	A	E		W	B	H	O	W	B	H	O	1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11			
Developmental Restrictions	1	0	0		0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0			
	0	0	2		0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0			
	0	2	0		1	0	0	0	1	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0			
	0	3	2		1	1	0	0	2	1	0	0	1	4	0	0	2	2	0	1	0	0	0	0	0	2	1	0	0	1	0	1	0	1	0	0		
	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Chronic Restrictions (agility/stamina/reaction time)	0	0	2		0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
Wheelchair Users	0	2	0		1	0	0	0	1	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
Walks w/ Special Aids	0	3	2		1	1	0	0	2	1	0	0	1	4	0	0	2	2	0	1	0	0	0	0	0	2	1	0	0	1	0	1	0	1	0	0	0	
Walks w/Difficulty	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upper Extremities	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Severe Auditory Impairment	1	0	0		0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Severe Visual Impairment	2	2	1		0	3	0	0	1	1	0	0	4	0	0	1	4	0	0	0	1	0	0	3	0	0	0	0	1	0	0	0	1	0	0	1	0	0
Confused/Disoriented	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	4	7	5		2	4	0	0	6	4	0	0	9	6	0	1	8	3	0	3	1	0	1	5	1	2	2	1	2	1	2	1	0	1	1	0	1	0
Legend:	Age	Accidents—Type												Components						Elements																		
C	Child	1. Falls on level												1. Walkways						1. Walks, corridors																		
A	Adult	2. Falls changing levels												2. Intersections						2. Crosswalks																		
E	Elderly	3. Pedestrian hit by vehicle												3. Parking lots/garages						3. Curbs, curbscuts																		
		4. Pedestrian and pedestrian												4. Public spaces/parks/recreation						4. Ramps																		
														5. Building entries/lobbies						5. Stairs																		
														6. Bus stops/terminals						6. Handrails																		
														7. Vehicle interior						7. Gratings, manhole covers																		
																				8. Signals																		
																				9. Pick-up, waiting areas																		
																				10. Doors, lobbies																		
																				11. Illumination																		

POPULATION DISTRIBUTION FROM CENSUS REPORTS

Table 31: Distribution of Population by Sex, Place of Residence (Urban and Rural) and Selected Age Groups - U.S. 1970

Age	Population by Sex			Urban			Rural		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Under 2	6,862,779	3,499,678	3,363,101	5,036,578	2,567,307	2,469,271	1,826,201	952,371	892,830
2-5	14,102,635	7,186,825	6,915,810	10,190,620	5,185,531	5,005,089	3,912,015	2,001,294	1,910,721
6-17	48,678,667	24,796,398	23,881,269	34,571,684	17,515,182	17,056,502	14,106,983	7,281,216	6,825,767
18-64	113,502,343	55,013,583	58,488,760	84,894,933	40,813,072	44,081,861	28,607,410	14,200,511	14,406,899
65-74	20,065,502	8,415,708	11,649,794	14,631,115	5,859,472	8,771,643	5,434,387	2,556,236	2,878,151
Total	203,211,926	98,912,192	104,299,734	149,324,930	71,958,564	77,366,366	53,886,996	26,953,628	26,933,368
White	177,748,975	86,720,987	91,027,988	128,773,240	62,210,243	66,562,997	48,975,735	24,510,744	24,464,991
Nonwhite	25,462,951	12,191,205	13,271,746	20,551,690	9,748,321	10,803,369	4,911,261	2,442,884	2,468,377
75 and over	7,630,046	2,978,624	4,651,442	5,595,231	2,074,004	3,521,227	2,034,815	904,620	1,130,195

SOURCE: U.S. Summary: General Population Characteristics, V. 1, Pt. 1, Table 50, p. 265, Table 52, p. 269-270, and Table 53, p. 276.

Table 32: Distribution of Population in Central Cities by Sex and Age Groups - U.S. 1970

Age	Total		Male		Female	
	Total		Male		Female	
Under 2	2,171,240	1,105,057	1,066,183			
2-5	4,255,418	2,160,914	2,064,504			
6-17	13,925,936	7,017,480	6,908,456			
18-64						
65 and over	6,842,135	2,721,488	4,120,647			
75 and over	2,572,285	950,740	1,621,545			
Total	63,921,684	30,409,942	33,511,742			
White	49,546,571	23,642,104	25,904,467			
Nonwhite	14,375,113	5,767,838	7,607,275			

SOURCE: U.S. Summary, General Population Characteristics V.1, Pt. 1, Table 52, p. 269-74.

Table 33 Age Distribution of Population by Region, United States 1970

Age	Northeast	North Central	South	West
Under 2	1,563,430	1,927,594	2,174,644	1,197,111
2-5	3,319,014	3,987,683	4,414,643	2,381,295
6-17	11,143,354	13,924,360	15,246,864	8,364,089
18-64	27,815,521	31,004,602	34,916,583	19,765,637
65-74	3,238,794	3,450,080	3,849,091	1,897,491
75+	1,960,590	2,277,344	2,193,542	1,198,570
Total Population	49,040,703	56,571,663	62,795,367	34,804,193
Urban Population	39,449,818	40,480,760	40,539,961	28,854,391
<p>SOURCE: U.S. Summary: General Population Characteristics, Vol. 1, Part 1, Table 56, p. 282 and Table 57, p. 286.</p> <p>Northeast:</p> <ul style="list-style-type: none"> a) New England - Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut. b) Middle Atlantic - New York, New Jersey, Pennsylvania. <p>North Central</p> <ul style="list-style-type: none"> a) East North Central - Indiana, Illinois, Michigan, Wisconsin. b) West North Central - Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas. <p>South:</p> <ul style="list-style-type: none"> a) South Atlantic - Delaware, Maryland, D.C., Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida. b) East South Central - Kentucky, Tennessee, Alabama, Mississippi. c) West South Central - Arkansas, Louisiana, Oklahoma, Texas. <p>West:</p> <ul style="list-style-type: none"> a) Mountain - Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona. b) Pacific - Washington, Oregon, California, Utah, Nebraska, Alaska, Hawaii 				

DISTRIBUTION OF POPULATION USING SPECIAL AIDS

Table 34: Percent of Population Using Special Aid* by Age and Sex
U.S., 1969

No. of Aid (1)	Age				All Ages (6)
	Under 15 (2)	15-44 (3)	45-64 (4)	65 and Over (5)	
Males Using					
(1) one type of aid	2.6	1.4	3.2	11.0	3.0
(2) two types of aid	—	0.1	0.4	1.4	0.3
(3) three or more types of aid	—	—	—	—	0.1
Total	2.6	1.5	3.6	12.4	3.4
Females Using					
(1) one type of aid	1.8	0.7	2.6	11.8	2.6
(2) two types of aid	—	—	0.3	1.6	0.3
(3) three or more types of aid	—	—	—	—	0.1
Total	1.8	0.7	2.9	13.4	3.0
<p>*Based on a sample of about 42,000 households (containing about 134,000 persons) interviewed during the 52 weeks of 1969.</p> <p>SOURCE: "Use of Special Aids"—US, 1969, DHEW Vital and Health Statistics, National Center for Health Statistics, series 10, No. 78.²⁶</p>					

Table 35: Number Using Special Aids per Thousand by Race, Family Income, Usual Activity and Limitation of Activity:
U.S. 1969

Characteristics (1)	Wheelchair (2)	Special Shoes Cane, Stick and Brace (3)	Crutches Walker Artificial leg or foot (4)	Other Aids (5)
Race				
White	2.1	29.0	5.0	.7
All Other	*	25.2	2.5	—
Family Income				
Less than 5,000	3.5	50.0	10.7	—
5,000-9,999	1.7	21.9	2.8	.7
10,000 or more	1.4	21.9	2.5	—
Usual Activity				
Usually Working (17+)	*	14.6	2.5	.7
Usually Keeping House (female, 17+)	1.9	36.9	6.5	—
Retired (45+)	11.8	149.2	25.7	—
Others (in- cluding -17)	2.7	21.8	3.3	—
Chronic Activity Limitation				
Unable to Carry on Major Activity	49.7	236.0	73.8	—
Limited in Amount or Kind of Major Activity	6.6	121.4	19.0	—
Limited, but not in Major Activity	—	92.5	—	—
Not Limited	—	13.5	.5	.3
Total	2.1	28.5	4.8	.9

*Based on a sample of about 42,000 households (containing about 134,000 persons) interviewed during the 52 weeks of 1969.

SOURCE: "Use of Special Aids" - US, 1969, DHEW Vital and Health Statistics National Center for Health Statistics, series 10, No. 78.²⁶

PREVALENCE OF IMPAIRMENTS

Table 36: Prevalence of Impairments (Except Paralysis or Absence) of Upper Extremity and Shoulder due to Injury and Number per 1,000 Population by Age and Selected Characteristics+ - U.S. 1971

Characteristics (1)	No. of Impairments (000)				No. per 1000 Population			
	All Ages (2)	Under 45 (3)	45-64 (4)	65 & Over (5)	All Ages (6)	Under 45 (7)	45-64 (8)	65 & Over (9)
Sex								
Male	1167	602	404	160	12.0	8.7	20.4	19.5
Female	533	206	192	134	5.1	2.9	8.8	12.0
Family Income								
under \$5,000	520	177	148	195	12.7	7.8	19.4	18.5
\$5,000-9,999	528	278	195	56	8.2	5.9	15.3	12.7
\$10,000-14,999	300	180	110	*	6.2	4.8	11.8	*
\$15,000 or more	247	137	97	*	6.9	5.4	11.0	*
Current Employment Status								
Currently Employed	991	544	388	59	12.8	11.5	14.4	18.6
Unemployed	76	*	*	*	13.4	*	*	*
Not in Labor Force	632	218	179	235	5.3	2.4	13.3	14.7
All	1699	808	596	295	8.4	5.7	14.3	15.2
+Similar distributions are also available by education of head of family.								
*Applies to numbers too small to report.								
SOURCE: "Impairments due to Injury", US - 1971, DHEW, Vital and Health Statistics, National Center for Health Statistics, series 10, Number 87. ¹⁹								

DISTRIBUTION OF POPULATION WITH SEVERE AUDITORY IMPAIRMENT

Table 37: Distribution of Population with Severe Auditory Impairment and of their Rates per Thousand Population by Race, Income, Education, Residence and Region each Classified by Age

Characteristics (1)	Number of Persons (000)				Rate per 1000 Persons			
	Total (2)	Under 45 (3)	45-64 (4)	65 & Over (5)	Total (6)	Under 45 (7)	45-64 (8)	65 & Over (9)
Race								
White	1468	263	393	813	9.0	2.4	11.8	52.3
Nonwhite	124	42	36	45	5.8	2.5	10.3	34.4
Income								
Under \$2,000	562	55	121	386	24.9	4.6	26.2	63.9
\$2,000-3,999	349	71	89	189	10.7	3.3	14.1	43.1
\$4,000-6,999	305	92	87	126	5.0	1.9	8.0	43.0
\$7,000 & over	289	70	110	110	5.0	1.7	8.7	47.3
Unknown	85	17	21	47	9.1	3.0	8.6	39.8
Education (17 years & over)								
Under 9 years	881	68	269	544	21.1	4.1	17.2	56.5
9-12 years	419	122	109	188	8.1	3.7	7.6	40.6
13 years & over	138	23	42	73	6.2	1.6	7.0	36.7
Unknown	66	4	9	54	25.0	3.9	9.0	88.2
Residence								
Urban	996	202	260	533	7.9	2.2	10.0	45.6
Rural Nonfarm	420	69	97	254	9.9	2.3	12.6	64.8
Rural Farm	176	34	71	71	13.0	3.7	22.2	55.7
Region								
Northeast	289	55	88	147	6.3	1.7	8.9	33.6
North Central	451	79	124	247	8.5	2.1	11.6	47.2
South	590	126	149	314	10.6	3.1	13.6	65.3
West	261	44	68	149	9.0	2.1	12.4	60.8

SOURCE:

"Characteristics of Persons with Impaired Hearing", US July 1962-June 1963, DHEW, Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 35.⁷⁶

DISTRIBUTION OF VISUALLY IMPAIRED POPULATION WITH RESPECT TO INCOME, EDUCATION, RACE, AND PLACE OF RESIDENCE

Table 38: Number (000) of Visually Impaired Persons Age 6 Years and Over by Degree of Impairment According to Age, Income, Education, Region, Race and Residence

(Col. 1)	6-64 Years		65 Years and Over		6 Years and Over	
	Cannot Read Newsprint (Col. 2)	Can Read Newsprint (Col. 3)	Cannot Read Newsprint (Col. 4)	Can Read Newsprint (Col. 5)	Cannot Read Newsprint (Col. 6)	Can Read Newsprint (Col. 7)
Income						
Under \$2,000	119	259	337	368	456	627
\$2,000-3,999	58	178	136	185	194	363
\$4,000-6,999	60	199	81	102	141	301
\$7,000 +	32	175	77	109	109	284
Education						
Under 9 years	181	360	461	528	642	888
9-12 years	75	301	123	168	198	469
13 years & over	—	88	47	93	47	181
Under 17 years	24	117	48	33	72	150
Unknown						
Region						
Northeast	56	140	141	173	197	313
North Central	66	169	184	201	250	370
South	144	417	264	338	408	755
West	24	140	91	110	115	250
Race						
White	221	686	595	747	816	1,433
Nonwhite	69	179	84	15	153	194
Residence						
SMSA	147	477	306	450	453	927
Nonfarm	117	302	319	314	436	616
Farm	26	87	54	58	80	145

SOURCE: "Characteristics of Visually Impaired Person," U.S. July 1963-June 1964, DHEW, Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 46.

Table 39: Number (000) and Rate per 1000 Persons of Visually Impaired Persons 6 Years and Over, by Degree of Impairment According to Sex and Age

Age	Both Eyes Involved				Male Female	
	Male		Female			
	Cannot Read Newsprint	Can Read Newsprint	Cannot Read Newsprint	Can Read Newsprint		
6-16	---	47	---	60	20,830	20,126
17-44	25	101	48	135	30,872	34,373
45-64	77	221	116	301	18,153	19,449
65-74	65	128	123	273	5,031	6,088
75 +	165	154	326	267	2,512	3,390
6-64	118	369	171	496	69,855	73,948
65 +	229	282	449	540	7,544	9,479
Total	348	651	621	1,036	77,398	83,426

SOURCE: "Characteristics of Visually Impaired Persons", U.S. - July 1963-June 1964, DHEW, Vital and Health Statistics, National Center for Health Statistics, Series 10, No. 46.³¹

CAUSES FOR OBVIOUS CONFUSION AND/OR DISORIENTATION

1. Alcoholism

- 1) Social Research Group of George Washington University conducted a national survey in 1965 (Cisin, I.H., Paper presented before the American Association for the Advancement of Science).⁹²

Study Findings

68% American adults (77% men and 60% women) drink--of which 56% are moderate to infrequent drinkers, and 12% (4 men to 1 woman) are heavy (including problem) drinkers.

- 2) Harold A. Mudford (Drinking and Deviant Drinking, U.S.A., 1963, Quarterly Journal of Studies on Alcohol, V. 25, 1964)⁹⁴ found that:

a greater portion of drinkers are 39 years old. Larger proportion of single males, those who live in cities, in Western states, with least education and low status jobs characterize heavy drinkers.

- 3) The exact number of alcoholics is estimated at 6.5 million in the 1960's (V. Efron and M. Keller, Selected Statistical Tables on the Consumption of Alcohol, 1850-1960, New Brunswick, N.J.: Rutgers Center of Alcohol Studies, 1963)⁸³ which is regarded as too conservative.

The National Council on Alcoholism estimated that in 1971, there were approximately 9 million alcoholics in the U.S.

- 4) Donald J. Giese, "Report on Drinking," St. Paul Pioneer Press, May 25, 1969,⁸⁴ observed that of the pedestrians killed in 1968 in Minnesota, 38 percent were tested, and 24 percent of those tested showed evidence of alcohol. Half of the pedestrians tested were 65 or older.

Alcoholics constitute about 3 percent of a work force (industrial, business and government).

Types and Phases of Alcoholism

The two categories of alcoholics as defined by the Alcoholism Subcommittee of the World Health Organization are "alcohol addicts" and "habitual symptomatic excessive drinkers" referred to as non-addictive alcoholics. Both are characterized by excessive drinking. But the former, after several years of excessive drinking, lose control while the latter do not (Jellinek, E.M., "The Disease Concept of Alcoholism," Hillhouse Press, 1960).⁸⁵

2. Drug Dependence

The term "drug dependence," rather than "drug addiction," has been accepted by the World Health Organization as well as by the National Research Council of the National Academy of Sciences. The WHO defines the term "drug dependence" as a "state of psychic or physical dependence, or both, on a drug arising in a person following administration of that drug on a periodic or continuous basis" (Nathan Eddy, H. Halback, Ing. Harris Isbel and Maurice H. Seevers, Drug Dependence: Its Significance and Characteristics, Bulletin WHO (1965), Vol. 32).⁸⁶

Three kinds of drug dependence have been classified. These are:

- 1) Narcotics
- 2) Hallucinogens
- 3) Amphetamines

Narcotics

Estimates of drug dependents are very difficult to make. However, when the New York City Department of Health undertook an intensive narcotics registration project, it was observed that about 1 in 80 persons in the city were addicted. Moreover, at Bellevue Hospital, it was found that for every chronic heroin user known to the police, at least one other was not. Hence, it was conservatively estimated in 1968 that there were about 50,000 addicts in New York and about 100,000 nationally (Louria, Donald B., The Drug Scene, McGraw Hill).⁸⁶ On a CBS news broadcast on March 12, 1970, Dr. Stanley Yolles, former director of the National Institute on Mental Health, was quoted as estimating that there are at least 100,000 to 50,000 hard narcotic addicts in the nation (U.S. Department of Health, Education and Welfare, Narcotic Drug Addiction, Mental Health Monograph No. 2, Bethesda, Maryland, 1965).⁸⁷

Hallucinogens

Estimates made by Louria about use of LSD stands at about 120,000 or less among college students, but none is known to be available for the rest of the population. Regarding the use of marijuana, a conservative Administration Task Force estimated that at least 5 million Americans have used marijuana at least once. Dr. Stanley Yolles estimates that it has

been used by at least 12 million, perhaps even as high as 20 million. But he also estimates that perhaps 65 percent of these are merely casual pot smokers.

Amphetamines

No exact figures are available, but as with hallucinogens, there has been increased use of stimulants. The number of illicit users of amphetamines is estimated to be in the millions, most taking stimulant pills such as dexedrine, amphetamine, sulphate, or methedrine and intravenously injected methamphetamine, specially among the young (Martindale, Don and Edith Martindale, The Social Dimensions of Mental Illness, Alcoholism and Drug Dependence, Glenwood Publishing Co.).⁸⁸

Combining all three categories, a rough estimate of total number of drug dependents would range anywhere from 5 to 10 million.

3. Mental Illness

During 1966, approximately 19 million (one out of ten) people suffered from mental or emotional illness that required treatment. About half a million children were mentally ill, most of them suffering from schizophrenia; very few of these children were receiving treatment. In the previous year, about 3.9 million Americans received treatment in private or public hospitals and clinics (Thomas S. Szasz, The Myth of Mental Illness: Foundations of a Theory of Personal Conduct, Harper and Row, 1968).⁸⁹

Approximately one-fourth of the 3.9 million patients were treated by the state and county mental hospitals as well as by the Veterans Administration Hospitals. For the state and county hospitals, it was noted that schizophrenic reactions, alcoholism disorders, and mental diseases associated with the aged constituted the majority of first admissions (National Institute of Mental Health, Patients in Mental Institutions, II, 1965).⁵⁰ A 1972 sample survey of admissions to state and county hospitals by the NIMH provides a breakdown of .4 million admissions by age, sex, color, and diagnosis.

4. Affected Population

An estimate of the population of alcoholics, drug dependents and mentally disturbed around 1970, assuming mutual exclusiveness, can be obtained by adding estimates of the subgroups noted earlier. It is felt that such estimates would lie between 18 and 23 million.

TRACKED SUBJECTS BY SUBGROUP: FIVE-CITY SURVEY

Table 40: Tracked Subjects by Subgroup: 5 Cities Total

Handicap	Male				Female			Total
	White	Black	Hispanic	Oriental	White	Black	Hispanic	
Developmental Restrictions	0	0	0	0	3	0	0	3
Chronic Restrictions (agility/stamina/ reaction time)	2	0	0	0	0	0	0	2
Wheelchair Users	37	6	1	1	28	3	0	76*
Walks w/ Special Aids	182	53	4	23	134	42	1	452
Walks w/ Difficulty	17	3	1	1	11	1	0	36
Upper Extremity	1	0	0	0	0	0	0	1
Severe Auditory Impairment	0	0	1	0	1	0	0	2
Severe Visual Impairment	23	5	0	1	13	0	0	43+
Confused/ Disoriented	1	1	0	0	1	0	0	4
Totals	263	68	7	26	191	46	1	619

*Six were electric wheelchairs

+Ten were children

Table 41: Tracked Subjects by Subgroup: Florida/St. Petersburg,
Tampa

Handicap	Male			Female			Total
	White	Black	Hispanic	White	Black	Hispanic	
Developmental Restrictions	0	0	0	1	0	0	1
Chronic Restrictions (agility/stamina/ reaction time)	1	0	0	0	0	0	1
Wheelchair Users	7	1	0	3	0	0	11
Walks w/ Special Aids	50	2	0	26	1	0	80
Walks w/ Difficulty	4	0	0	3	1	0	8
Upper Extremities	1	0	0	0	0	0	1
Severe Auditory Impairment	0	0	0	1	0	0	1
Severe Visual Impairment	5	0	0	1	0	0	6
Confused/ Disoriented	0	0	0	0	0	0	0
Totals	68	3	0	35	2	0	109

Table 42: Tracked Subjects by Subgroup: Illinois/Chicago

Handicap	Male				Female			
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental
Developmental Restrictions	0	0	0	0	1	0	0	0
Chronic Restrictions (agility/stamina/ reaction time)	1	0	0	0	0	0	0	0
Wheelchair Users	1	4	1	0	6	3	0	0
Walks w/ Special Aids	28	19	1	1	31	20	0	0
walks w/ Difficulty	4	1	0	0	4	0	0	0
Upper Extremities	0	0	0	0	0	0	0	0
Severe Auditory Impairment	0	0	0	0	0	0	0	0
Severe Visual Impairment	5	2	0	0	2	0	0	0
Confused/ Disoriented	0	0	0	0	0	0	0	0
Totals	39	26	3	1	44	23	0	0
								136

Table 43: Tracked Subjects by Subgroup: California/San Francisco

Handicap	Male				Female				Total
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental	
Developmental Restrictions	0	0	0	0	0	0	0	0	0
Chronic Restrictions (agility/stamina/ reaction time)	0	0	0	0	0	0	0	0	0
Wheelchair Users	10	0	0	0	6	0	0	0	16*
Walks w/ Special Aids	39	7	1	19	37	2	12	0	117
Walks w/ Difficulty	5	0	0	0	1	0	0	2	8
Upper Extremities	0	0	0	0	0	0	0	0	0
Severe Auditory Impairment	0	0	1	0	0	0	0	0	1
Severe Visual Impairment	5	0	1	0	2	0	0	0	8
Confused/ Disoriented	1	0	0	1	1	0	0	1	4
Totals	60	7	3	20	47	2	12	3	154
*Three were electric wheelchairs									

Table 44: Tracked Subjects by Subgroup: Washington/Seattle

Handicap	Male			Female			Total
	White	Black	Hispanic	White	Black	Hispanic	
Developmental Restrictions	0	0	0	0	0	0	0
Chronic Restrictions (agility/stamina/ reaction time)	0	0	0	0	0	0	0
Wheelchair Users	18	1	0	13	0	0	33*
Walks w/ Special Aids	55	4	1	35	4	1	103
Walks w/ Difficulty	3	0	1	1	0	0	5
Upper Extremities	0	0	0	0	0	0	0
Severe Auditory Impairment	0	0	0	0	0	0	0
Severe Visual Impairment	8	1	0	8	0	0	19+
Confused/ Disoriented	0	0	0	0	0	0	0
Totals	84	6	2	57	4	1	160
*Three were electric wheelchairs							
+Ten were children							

Table 45: Tracked Subjects by Subgroup: Georgia/Atlanta


Handicap	Male				Female			
	White	Black	Hispanic	Oriental	White	Black	Hispanic	Oriental Total
Developmental Restrictions	0	0	0	0	1	0	0	1
Chronic Restrictions (agility/stamina/reaction time)	0	0	0	0	0	0	0	0
Wheelchair Users	1	0	0	0	0	0	0	1
Walks w/ Special Aids	10	21	0	0	5	15	0	51
Walks w/ Difficulty	1	2	0	1	2	0	0	6
Upper Extremities	0	0	0	0	0	0	0	0
Severe Auditory Impairment	0	0	0	0	0	0	0	0
Severe Visual Impairment	0	1	0	0	0	0	0	1
Confused/Disoriented	0	0	0	0	0	0	0	0
Totals	12	24	0	1	8	15	0	60



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FEDERALLY COORDINATED PROGRAM (FCP) OF HIGHWAY RESEARCH AND DEVELOPMENT

The Offices of Research and Development (R&D) of the Federal Highway Administration (FHWA) are responsible for a broad program of staff and contract research and development and a Federal-aid program, conducted by or through the State highway transportation agencies, that includes the Highway Planning and Research (HP&R) program and the National Cooperative Highway Research Program (NCHRP) managed by the Transportation Research Board. The FCP is a carefully selected group of projects that uses research and development resources to obtain timely solutions to urgent national highway engineering problems.*

The diagonal double stripe on the cover of this report represents a highway and is color-coded to identify the FCP category that the report falls under. A red stripe is used for category 1, dark blue for category 2, light blue for category 3, brown for category 4, gray for category 5, green for categories 6 and 7, and an orange stripe identifies category 0.

FCP Category Descriptions

1. Improved Highway Design and Operation for Safety

Safety R&D addresses problems associated with the responsibilities of the FHWA under the Highway Safety Act and includes investigation of appropriate design standards, roadside hardware, signing, and physical and scientific data for the formulation of improved safety regulations.

2. Reduction of Traffic Congestion, and Improved Operational Efficiency

Traffic R&D is concerned with increasing the operational efficiency of existing highways by advancing technology, by improving designs for existing as well as new facilities, and by balancing the demand-capacity relationship through traffic management techniques such as bus and carpool preferential treatment, motorist information, and rerouting of traffic.

3. Environmental Considerations in Highway Design, Location, Construction, and Operation

Environmental R&D is directed toward identifying and evaluating highway elements that affect

the quality of the human environment. The goals are reduction of adverse highway and traffic impacts, and protection and enhancement of the environment.

4. Improved Materials Utilization and Durability

Materials R&D is concerned with expanding the knowledge and technology of materials properties, using available natural materials, improving structural foundation materials, recycling highway materials, converting industrial wastes into useful highway products, developing extender or substitute materials for those in short supply, and developing more rapid and reliable testing procedures. The goals are lower highway construction costs and extended maintenance-free operation.

5. Improved Design to Reduce Costs, Extend Life Expectancy, and Insure Structural Safety

Structural R&D is concerned with furthering the latest technological advances in structural and hydraulic designs, fabrication processes, and construction techniques to provide safe, efficient highways at reasonable costs.

6. Improved Technology for Highway Construction

This category is concerned with the research, development, and implementation of highway construction technology to increase productivity, reduce energy consumption, conserve dwindling resources, and reduce costs while improving the quality and methods of construction.

7. Improved Technology for Highway Maintenance

This category addresses problems in preserving the Nation's highways and includes activities in physical maintenance, traffic services, management, and equipment. The goal is to maximize operational efficiency and safety to the traveling public while conserving resources.

0. Other New Studies

This category, not included in the seven-volume official statement of the FCP, is concerned with HP&R and NCHRP studies not specifically related to FCP projects. These studies involve R&D support of other FHWA program office research.

* The complete seven-volume official statement of the FCP is available from the National Technical Information Service, Springfield, Va. 22161. Single copies of the introductory volume are available without charge from Program Analysis (HRD-3), Offices of Research and Development, Federal Highway Administration, Washington, D.C. 20590.

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